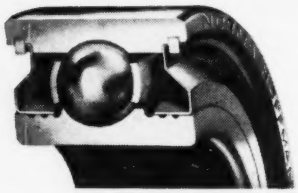
October, 1949

MODERN Machine Shop

NORMA-HOFFMANN "CARTRIDGE" BEARINGS

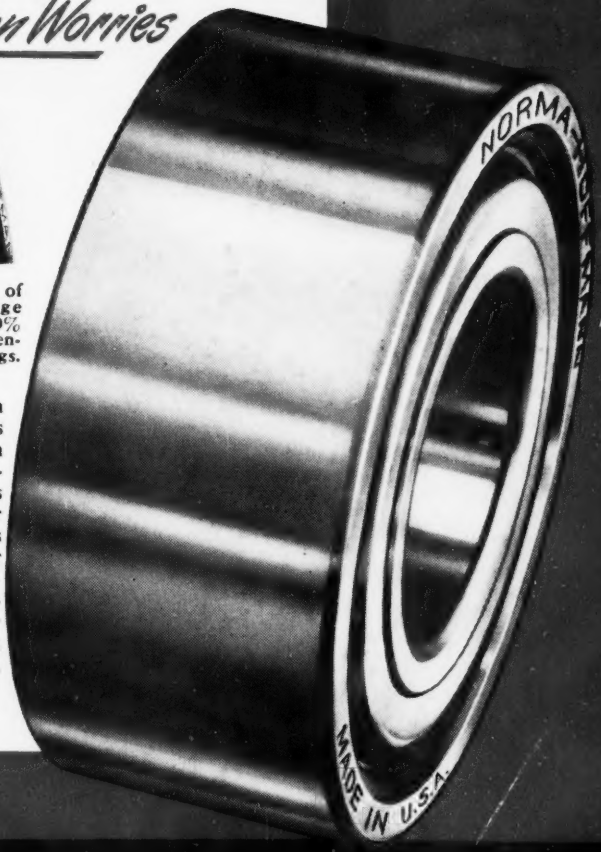
End Lubrication Worries



Note the large grease reservoir of the Norma-Hoffmann Cartridge Bearing . . . actually gives 100% more grease capacity than conventional shielded and sealed bearings.

Designers of equipment can eliminate bearing failures caused by dry bearings with Norma-Hoffmann "Cartridge" Bearings. Actual tests as shown by a recent motor survey* prove these bearings cut yearly costs by $750 per 100 motors by reducing relubrication expense and motor outage. Reduce costs by using Norma-Hoffmann "Cartridge" Bearings. Write.

*Survey sent on request.



NORMA-HOFFMANN BEARINGS CORP., STAMFORD, CONNECTICUT

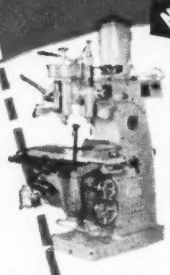
Send FOR THIS CATALOG

It will acquaint you with the complete line of GORTON TRACER-CONTROLLED MACHINE TOOLS and Accessories

Send for your copy today. Gorton tracer-controlled milling embodies distinct advantages on the production line and in the tool room. In many cases, special tooling will make a given operation entirely automatic. Send for the Gorton Condensed Catalog illustrated above, or for any of the other specialized bulletins described below — they were published for your information and reference.

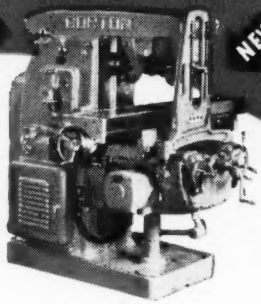
NEW

0-16A VERTICAL
Incorporates all of the desirable features of former 8-D. Also available with swivel or universal head. Bulletin 2240.



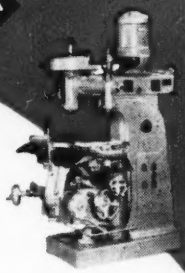
NEW

0-16A DUPLICATOR
Rugged, versatile and extra sensitive for exacting die and mold work. Also available with swivel or universal head. Bulletin 1339.

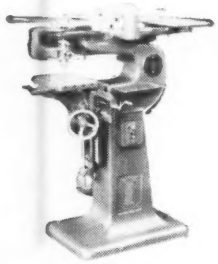


NEW

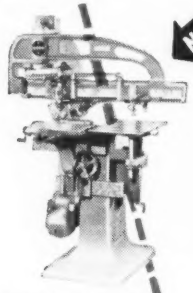
2-28B HORIZONTAL
No. 2 size, fullwidth plain type mill with 10 H.P. spindle drive and speeds up to 2,000 r.p.m. Built for maximum rigidity and a work horse load. Bulletin 2321.



9-J DUPLICATOR
Rugged in construction; has *Gorton super-speed spindle and sensitive controls for the most exacting work. Bulletin 1319.

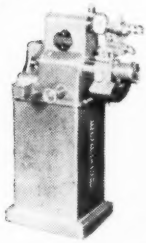


3-U PANTOGRAPH
Sturdy and rigid with sensitive tracer control. Larger and heavier 3-Z model also available. Bulletin 1580.

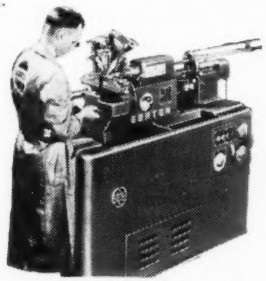


NEW

P13 PANTOGRAPH
†Ratiobar Pantograph for 3-dimensional work. First basic design improvement in pantograph construction. Bulletin 2310.



375-2 CUTTER GRINDER
Universal type; bench or floor models; capacity up to 5/8" dia., including ball nose and multi-flute cutters. Bulletin 1317.



16-B AUTOMATIC LATHE
For precision turning of long slender parts from .005" dia., by 1/32" long to 7/8" dia., by 2¾" long. Bulletin 1800.

*Trade Mark Reg. U. S. Pat. Office

†Pats. Applied For

GEORGE GORTON MACHINE CO.

1710 Racine Street, Racine, Wisconsin, U.S.A.

Please Send at Once

For brief facts about the Gorton line of tracer-controlled machines, use coupon or company letterhead and request Bulletin 1655 illustrated above. For specific information on certain machines, see text accompanying each illustration.

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LUME 22 NUMBER 5
OCTOBER, 1949

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MODERN Machine Shop

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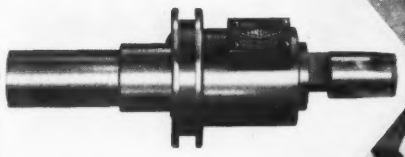
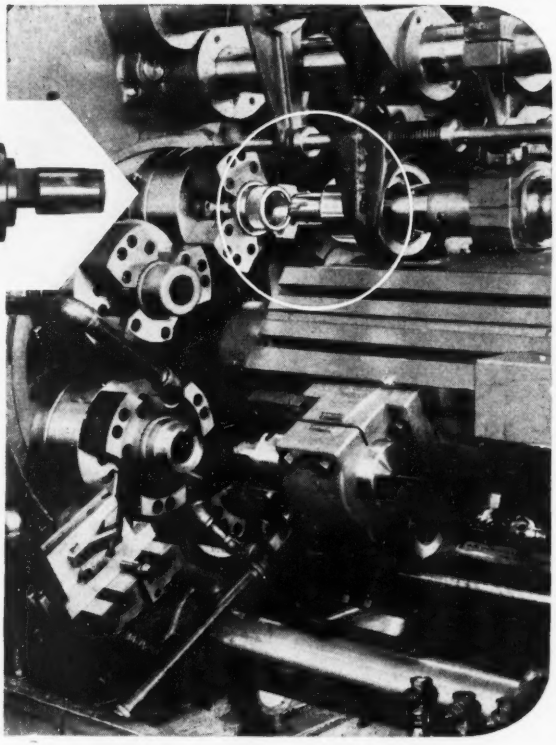
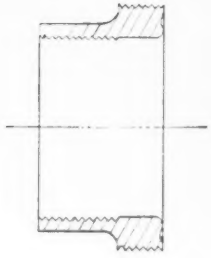
IMPROVED LANDIS TAP...





• CUTS INTERNAL TAPERED THREADS AT 30 FEET PER MINUTE.



2" 11½ pitch tapered threads 1-5/16" in length were tapped in quick change unions at 30 feet per minute. The unions are cold worked forging 2⅜" diameter of 185-220 Brinell hardness.

Landis LL Receding Chaser Collapsible Taps are designed primarily for tapping tapered threads to A.P.I. standards. The detachable tap head permits using various size tap heads to cover a wide range of thread sizes with a minimum amount of equipment. The LL Tap Body is made in four sizes to cover a range of nominal pipe sizes from 1" to 12", inclusive.

Write for Bulletin G-95

LANDIS MACHINE CO.
WAYNESBORO, PA., U. S. A.

A complete line of

NEW Heald Hi-Frequency RED HEADS

Give you <u>more</u> speed, economy and precision in small hole grinding

This Heald Model 180 Centerless Internal Grinder is equipped with a Hi-Frequency Red Head wheelhead, for faster, more economical grinding of small bore bearing races.

• The necessity for increasing wheel speed to obtain proper surface feet per minute in small hole grinding is generally enough reason for manufacturers to consider the use of high-frequency equipment. But when this demand is coupled with requirements of speed, economy and efficiency, most people naturally are turning to Heald for the answer.

New Heald Hi-Frequency Red Head Wheelheads are designed to operate at speeds well in excess of the normal belt driven type giving you the extra surface feet per minute required.

Heald Hi-Frequency Red Heads permit extremely high speed and virtually vibrationless operation, thereby effectively increasing the precision characteristics of the finished product.

The application of Heald Hi-Frequency equipment is not confined to the grinding of very small holes alone. Some manufacturers have found the use of Hi-Frequency heads to be extremely satisfactory for larger size work. But large or small, the application of high-frequency equipment is a specialized proposition. Why not let your nearest Heald representative discuss your particular high speed, high accuracy grinding requirements with you?

HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

THE HEALD MACHINE COMPANY
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Branch Offices in Chicago • Cleveland • Dayton • Detroit
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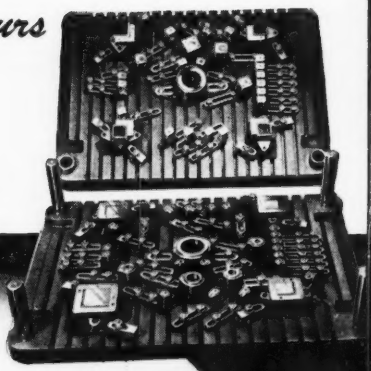
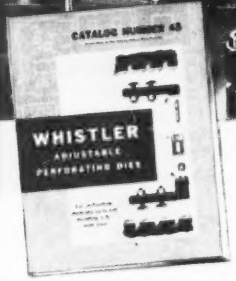
Get into Production in a few hours with

WHISTLER ADJUSTABLE DIES



Whistler Adjustable Perforating Dies are in use everywhere... working in both large and small presses.



There are plenty of other advantages in using Whistler Adjustable Dies. It makes sense to get the complete story. And it's easy to do. Write for your Whistler Catalog today.

Whistler perforating dies now offer a double-barreled advant in getting into production faster. Standard sizes of round h punches and dies... 1/32 to 3"... can be shipped promptly. Spe shapes... squares, ovals, rectangles, group and notching dies, quickly made to order.

Equally important, set-ups are simple... take only a short ti Same units can be rearranged or units added in setting up dif ent jobs. Production is thus speeded while die costs are amorti through continued re-use. No special tools are needed. All pa are interchangeable. The heavy duty series of punches and d easily pierce materials up to 1/4" mild steel.

S. B. WHISTLER & SONS, INC

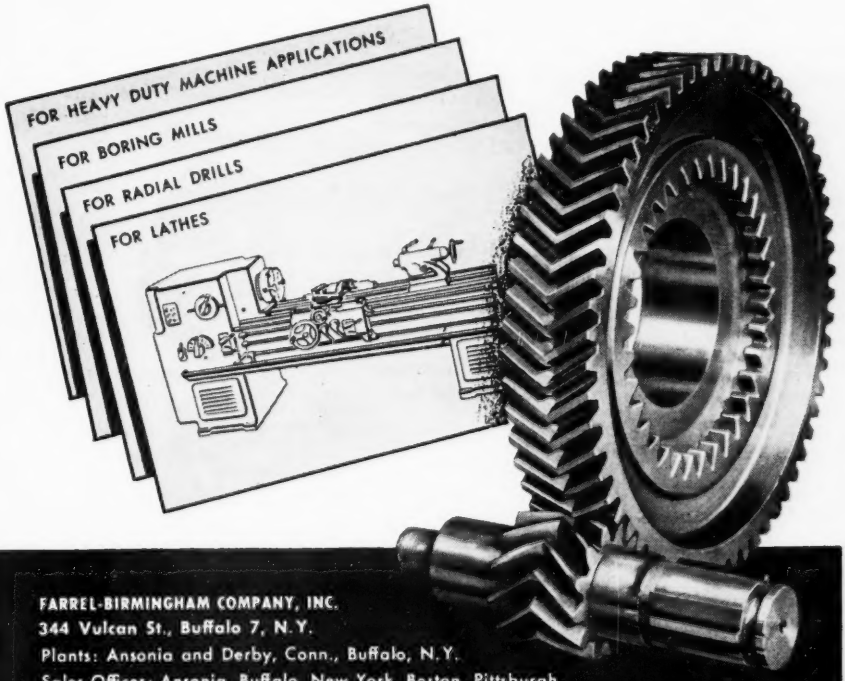
740 MILITARY ROAD • BUFFALO 17, NEW YO

HOW "A SMOOTHER ROLLING ACTION" CAN BE DESIGNED INTO MACHINE TOOLS

Because Farrel-Sykes herringbone gears — the famous *Gear with a Backbone* — have continuous teeth without a center groove, the entire face width is put to work, providing a greater area of tooth contact. This results in greater strength and smoother rolling action.

This is one of the principal reasons why so many manufacturers specify the *Gear with a Backbone* for their lathes, drills, boring mills and other machine tools. In addition, they find that the accurate tooth contour of these gears, coupled with correct tooth action, gradual engagement and oblique lines of contact, keeps wear to an absolute minimum.

Farrel-Sykes gears are available to you, too, in any size up to 20 feet in diameter, for practically any application. Information and engineering assistance are yours, without obligation.



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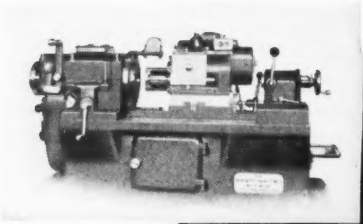
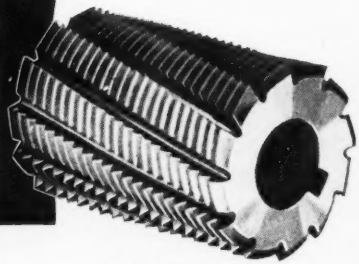
Plants: Ansonia and Derby, Conn., Buffalo, N.Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Los Angeles, Tulsa, Houston.

FB-510

STOP COSTLY SPOILAGE

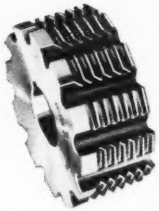
use Hanson-Whitney multiple thread Milling Cutters





Shell Type Cutter for external thread milling, Thread Rolling Dies, etc.

Taper Shank Cutter for internal thread milling.



Shell Type Cutter for short external threads.

H-W Ground Multiple Thread Milling Cutters are finished all over, AFTER hardening, to the closest of limits.

Angle of thread, relief and spacing of threads are very accurately controlled. Teeth can be spaced minus or plus to compensate for hardening variations in the product... a valuable feature on Cutters for Milling Thread Rolling Dies, as teeth can be spaced minus, to compensate for Helix Angle of thread.

Used in combination with H-W Thread Millers, H-W Cutters will give you 100% perfect threads on a production basis... without COSTLY SPOILAGE.

If you're having threading problems...here's the solution.

HANSON-WHITNEY MACHINE CO., HARTFORD 2, CONN.

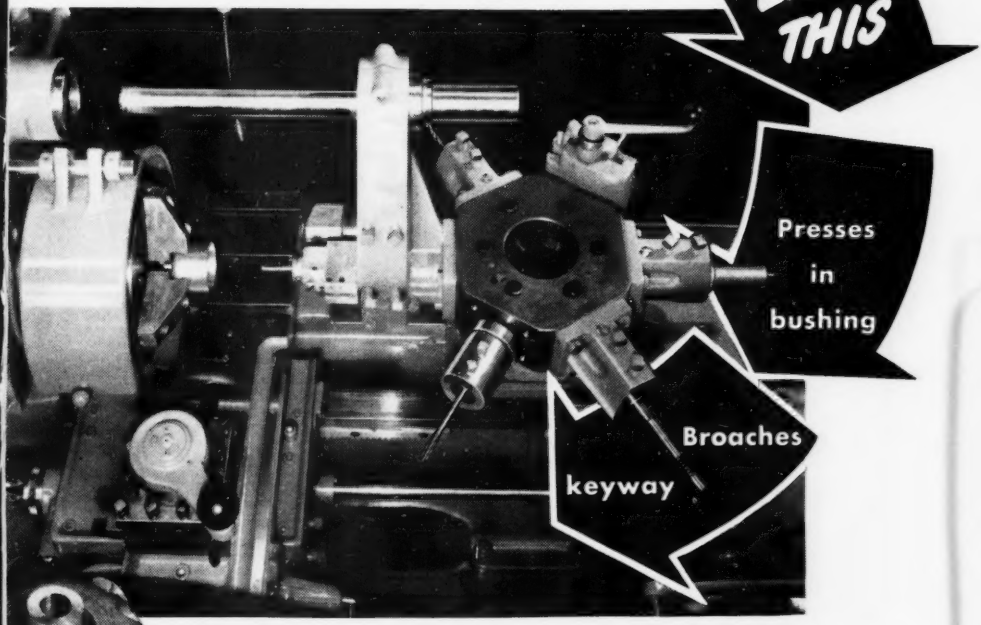
Division of Whitney-Hanson Industries, Inc.

For practical recommendations submit your problems to Hanson-Whitney engineers.

Hanson-Whitney

PIONEERS OF FINISHED TAPS

Turret Lathe Ideas—



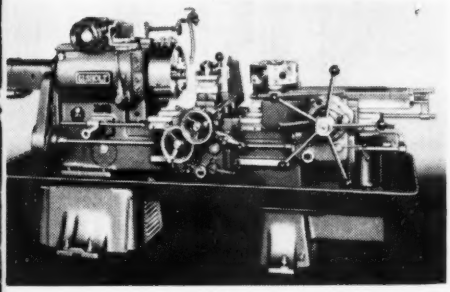
Save you time and money... INCREASE PRODUCTION!

Darned clever, these production men!

Note the use of this Gisholt No. 3 Ram Type Turret Lathe. In addition to handling all the typical drilling, boring, facing and reaming operations on the inside of a small motor housing, this turret lathe is used to:

Broach the keyway
Press in a bushing
Finish machine in place

olt No. 3 Universal Ram Type Turret Lathe



The entire operation on these parts takes only 1.37 minutes. Figure the time and cost saved in not having to transfer parts to other machines—or other departments—for these operations.

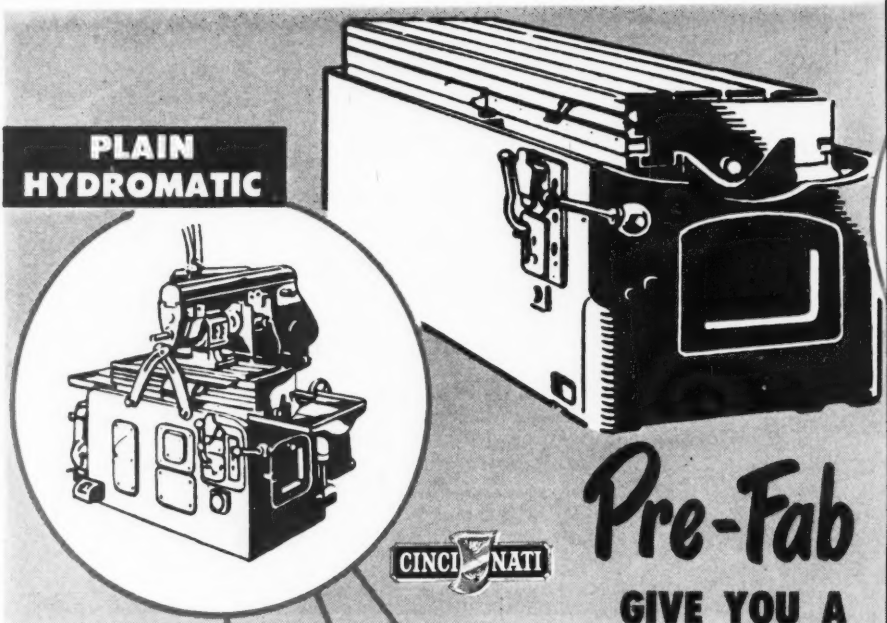
Don't overlook the many ways you can get greater production from your turret lathes. Gisholt engineers have all kinds of money-saving ideas to help you with your problems. Ask one to call. Or write us.

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wis.

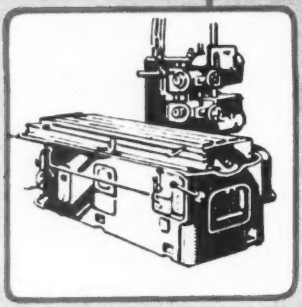
T LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

PLAIN HYDROMATIC

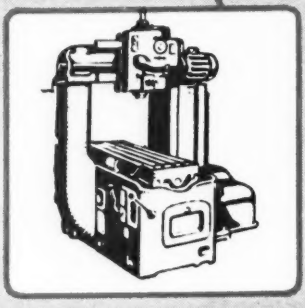


CINCINNATI

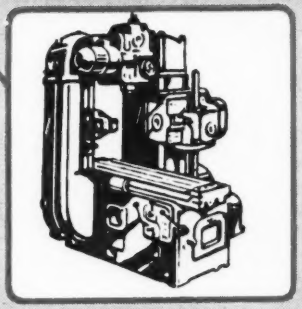
Pre-Fab GIVE YOU A SPINDLE HEAD



with close-coupled spindle carrier

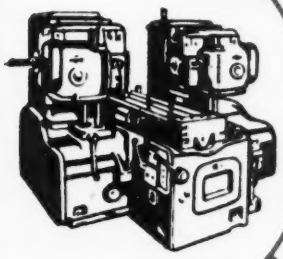


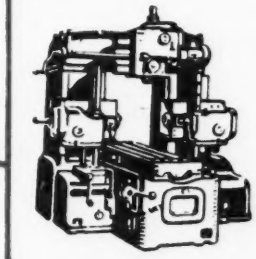
without conventional spindle carrier; with fixed height rail and vertical head



with fixed height rail and vertical head

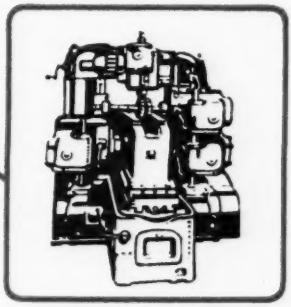
DUPLEX HYDROMATIC





with fixed height rail and vertical head

with fixed height rail, vertical head, and two right-hand spindle carriers ▼



Hydromatic Units

CHOICE OF ARRANGEMENTS

Built up on standard plain and duplex styles, CINCINNATI Hydromatic Milling Machines are designed to give you a selection of standard and complementary units such as:

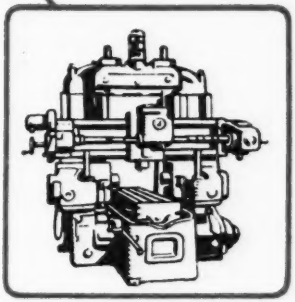
1—Close-coupled spindle carriers

2—Vertical spindle heads, single or close-coupled

3—Fixed height or adjustable bridge type rail support for vertical spindle heads

4—Extra wide bed for increased capacity

Perhaps the milling operations on parts in your shop could be handled at lower costs on CINCINNATI Hydromatics, built to your requirements from standard and complementary units. Our field engineers are at your service. Ask for catalog M-1372-1.



with adjustable height rail and vertical head

THE CINCINNATI MILLING MACHINE CO.

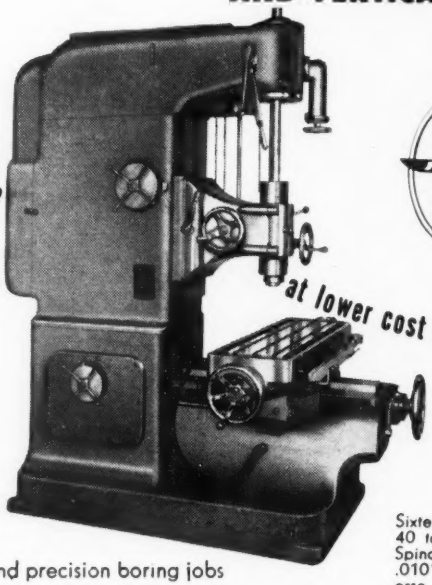
CINCINNATI 9, OHIO, U. S. A.

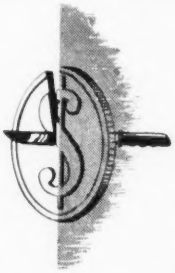
MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

KNIGHT NO. 50

FOR PRECISION BORING AND VERTICAL MILLING

more output in less time





at lower cost and less labor

Here is a single solid base machine

- — that will do the work of 2 or more machines
- — that performs an exceptionally wide range of difficult vertical milling and precision boring jobs
- — that eliminates time-wasting work transfers and expensive extra setup time
- — that does its work with toolroom precision and production line speed
- — that is ruggedly built with power to spare for handling the toughest jobs
- — that is engineered for extreme accuracy and easy, effortless operation
- — that pays off in increased output, lower labor saving and lower costs

Sixteen Spindle speeds, 40 to 2000 r.p.m. • 9 Spindle feeds, .005" to .010" • 100" table traverse per minute in both directions • 16 Table feeds, 5/16" to 20" per minute • 7½ h.p. Drive

Get All The Details

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MACHINERY COMPANY

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W. B. KNIGHT MACHINERY CO., 3920 West Pine, St. Louis 8, Mo.

We would like to have your catalog on the No. 50 and other Knight Milling Machines.

Name_____

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MORE GOODS for MORE PEOPLE at LOWER COST

Gear Finishing by a New FELLOWS PROCESS

1. **Gear Shaving by a new principle, employing a free-cutting tool, that avoids burnishing.**
2. **Cutters sharpened in your own plant by a simple face grinding operation.**
3. **Both sides of teeth finished in one cutter traverse... Fast action, full automatic cycling.**
4. **Stock removal possibilities greater than ever before.**

● *Write or telephone the nearest Fellows Office for machine data, production time estimates, etc.*

Fellows

The Fellows Gear Shaper Co., Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Building, Detroit 2; 640 West Town Office Building, Chicago 12; 7706 Empire State Building, New York 1.

LANDIS TOOL

hydraulic

operation

provides

THE VELVET TOUCH

10" x 24" Type CH Hydraulic Universal Grinder. Catalog I-45

EQUIPPED WITH MICROSPHERE BEARINGS

LANDIS TOOL leadership in the application of hydraulic operation to precision grinders is an important factor in the high production and fine finish which is obtained on these machines.

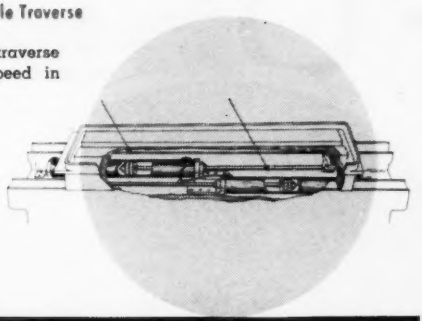
We shall be glad to send you, on request, our new condensed catalog which describes the features in more detail and gives condensed specifications for the complete line of LANDIS TOOL standard and special purpose precision grinders.

LANDIS TOOL *Precision Grinders*

1025

Smooth Hydraulic Power for Table Traverse

Double cylinder hydraulic traverse gives constant work table speed in either direction.

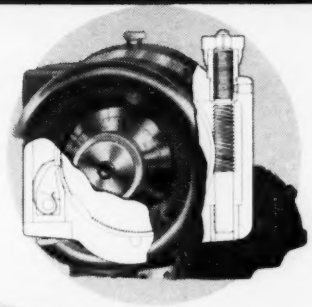


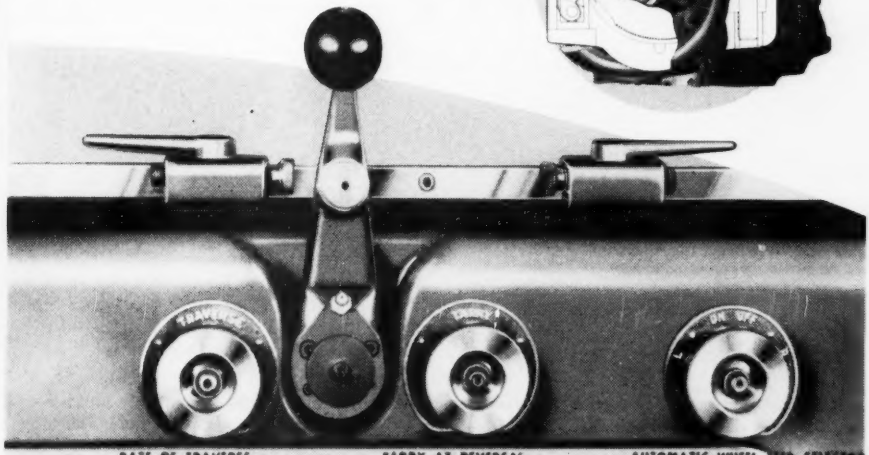
that Produces Fine Finishes

Hydraulic Automatic Wheel Feed

Lowers Setup Time, Increases Production

At table reversal the wheel feeds up hydraulically by the amount preset on the graduated adjusting knob.





RATE OF TRAVERSE
Easily adjusted to fit the grinding job.

TARRY AT REVERSAL
Adjustable for type of traverse grinding.

AUTOMATIC WHEEL FEED SELECTOR
Conveniently located. Helps to lower setup time.

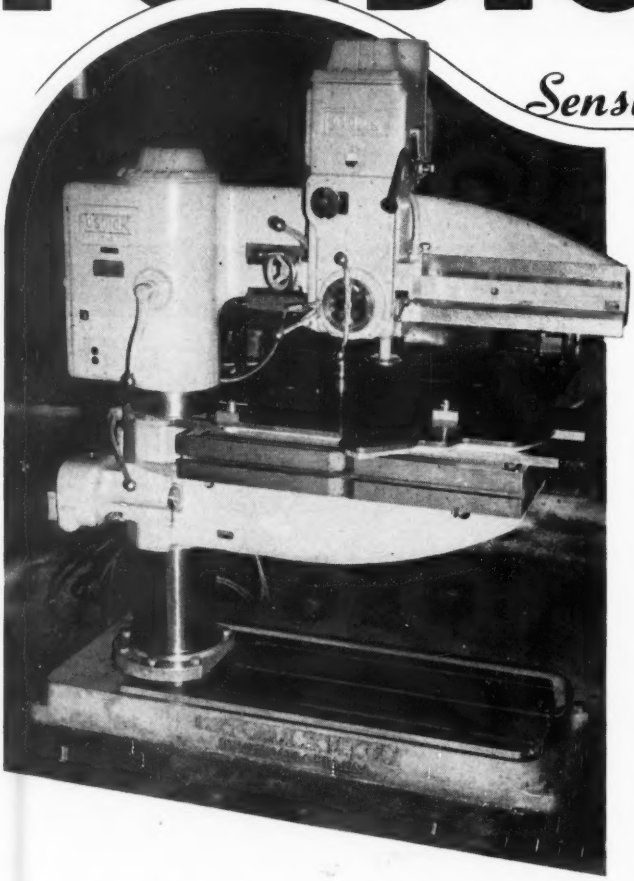
features of LANDIS TOOL Hydraulic Universal Grinders

1. MICROSPHERE WHEEL SPINDLE BEARINGS
2. EYE LEVEL WHEEL FEED
3. HYDRAULIC OPERATION
4. VARIABLE SPEED HEADSTOCK
5. RAPID HYDRAULIC WHEEL POSITIONING
6. SWINGING INTERNAL FIXTURE

LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

FOSDICK

Sensitive **RADIA**



. . . ideal for template drilling

• The combined advantages of Radial design and Sensitive drilling make this machine ideal for template drilling. The adjustable, swinging table also works out advantageously on this job as well as many other types of work.

Note that the head, located at a fixed height within normal reach of the operator, and the table swing in an arc of 360°. The table can be equipped with power elevation with safety trip at the top and bottom of extreme travel.

All speed and feed controls are located on the head for operating convenience. The machine handles sensitive drilling, reaming, tapping and similar operations on holes up to 1½ inch diameter.

Regardless of whether you operate a large or small shop here's a machine that fits into your production lineup.

For full details write for bulletin Fosdick Sensitive Radials S.R.M.M.S.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

Finest for SPEED: Taps more quality threads per hour, more holes than any other tapping attachment.

Finest for ACCURACY: Attaches firmly to drill press or tapping device.

Finest for VERSATILITY: Taps anything from soap to nickel steel without pressure on tap — prolongs tap life.

Finest for ADAPTABILITY: Five sizes, standard or built-in models, will fit any drill press or tapping device. 0-1½" cap.

Finest for MAINTENANCE: Requires little or no maintenance.

TORQOMATICS, when used with Jarvis TECHNI-TAPS, make the finest possible combination for low-cost, high-quality tapping. Send for free, illustrated, descriptive literature to The Charles L. Jarvis Company, Middletown, Conn.

Jarvis POWER TOOLS

TAPPING ATTACHMENTS • TECNI-TAPS and DIES • ROTARY FILES
FLEXIBLE SHAFTS and MACHINES • QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

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Contour-matic...
HAS 55
NEW FEATURES
IN ITS
ADVANCE DESIGN
FOR FASTER
PRECISION
PRODUCTION
DoALL
Now with ONE MACHINE
Cut every METAL!
PLUS ANY OTHER SOLID MATERIAL
Employs 244 different
band tools for machining, sawing,
grinding, honing, filing,
slicing, friction sawing
and polishing
See at Metals Congress
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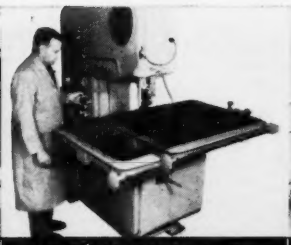
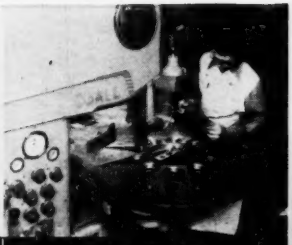
DoALL's MANUFACTURING MACHINE TOOL

Finger tip operation is centralized at this panel containing all automatic controls



Work Table is hydraulically operated and designed for holding the work



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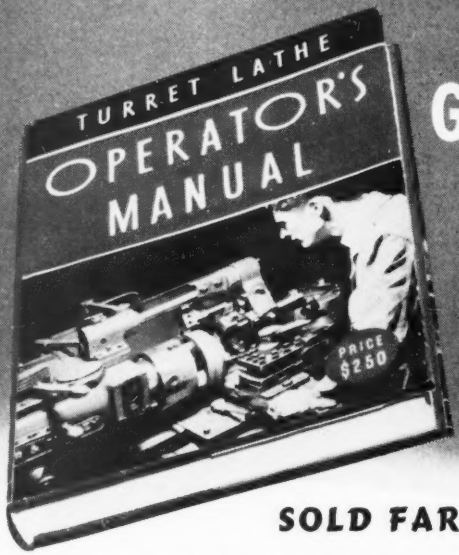

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TURRET LATHES
MULTIPLE AND SINGLE SPINDLE AUTOMATICS—PRECISION TAPPING AND THREADING MACHINES

those who buy Gilbert buy again and again

The new head on Gilbert 9" and 11" radials is the latest of many forward steps that have kept Gilbert users coming back for more. The controls are arranged for utmost convenience, give the operator instant response, save valuable minutes every hour—help get more work out *right*, and *on time* . . . Operators appreciate too, the heft and balance of the new Gilbert arm, which cuts vibration way down even on heavy work at the extreme end . . . Get the full story on the 12 new design and construction improvements that make Gilbert multi-duty radials *better buys than ever.* Write for new bulletin No. 349, or better still call in your Gilbert engineering representative. The Cincinnati Gilbert Machine Tool Company, 3360 Beekman Street, Cincinnati 23, Ohio.

THE CINCINNATI

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MACHINE TOOL COMPANY

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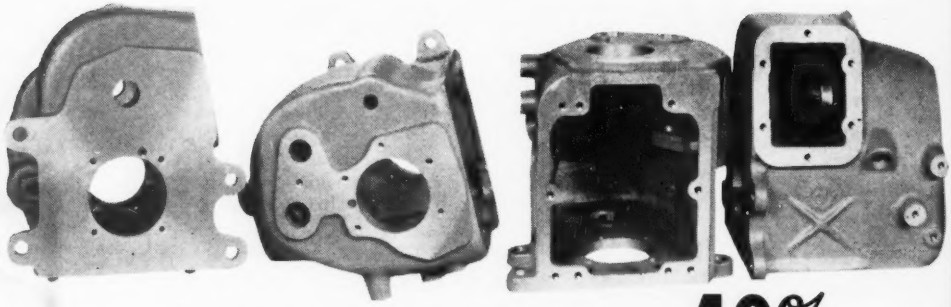
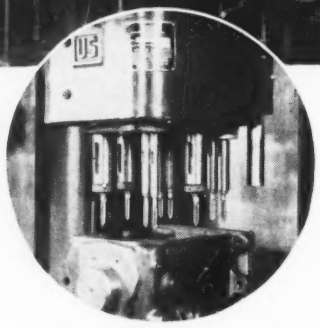
THOSE WHO BUY GILBERT BUY AGAIN AND AGAIN



TAPPING PRODUCTION: UP 40%



CLEVELAND *lead screw* **tapping machines**

New Process Gear Corporation, a leading manufacturer of automotive transmissions, finds Cleveland Lead Screw Tapping Machines an important aid in cutting production tapping time and costs.

New Process transmission cases, with nine 5/16"—18 and sixteen ⅜"—16 tapped holes in four faces, were formerly tapped on single spindle tappers.

By replacing the single spindle tappers with four Clevelands with multiple heads, each tapping all holes in one face at a single stroke, production was increased 40% with an attendant cost reduction.

In addition, elimination of much handling with consequent operator fatigue, in combination with Cleveland's fast, automatic cycling, permits tapping machines to be grouped with drilling and other machines in various production lines with further important economies.

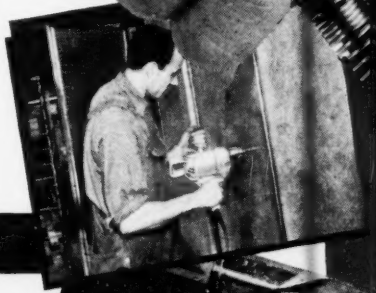
Finally, Cleveland's positive lead-screw feed has greatly improved thread quality, practically eliminated tap breakage and extended tool life an estimated 50%.

On the basis of increased production and economies, New Process is now using eleven standard Cleveland Lead Screw Tapping Machines and two special Cleveland machines. If you have a production tapping job—one hole or a hundred—Cleveland engineers can doubtless find similar opportunities for cost and time savings. Send prints and parts for study and recommendations, or a representative will call to discuss your problems personally. The Cleveland Tapping Machine Company, Hartville, Ohio.

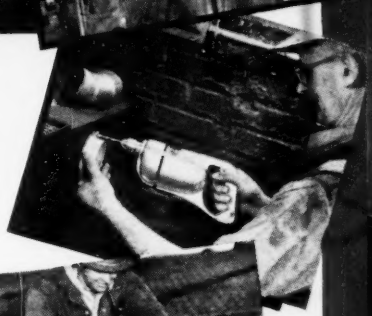
SKIL Drills...

26 fast, powerful answers to production and maintenance problems

Tight spots and tough materials are no problem to the man with a SKIL Drill in his hand. Whatever the job, there's a SKIL Drill that's perfect for it . . . 26 models to choose from. And in every one you get surplus power, perfect balance, the smoothness and long wear of quality bearings . . . you get the easy, balanced handling that is engineered into these fine tools. For repair work, general maintenance or a specific production line job, your best drill is SKIL Drill. Ask your SKIL Tool Distributor to show you why, today!



Here are some of the reasons SKIL Drills do better jobs for you!



Powerful, Universal Motors—Balanced, dynamically and statically for smoothest, most dependable operation. Designed for D.C. or A.C. up to 60 cycles.

Helical Cut Gears—Precision cut for quiet running and long life.

Bearings—Top quality bearings minimize friction, eliminate vibration.

Aluminum Alloy Body—High-strength, die-cast housings give added sturdiness and greater accuracy in fit. Parts are always completely interchangeable.

Perfect Balance—Compactness and perfect balance in every SKIL Drill provide maximum handling ease in all drilling positions.

SKILSAW, INC.
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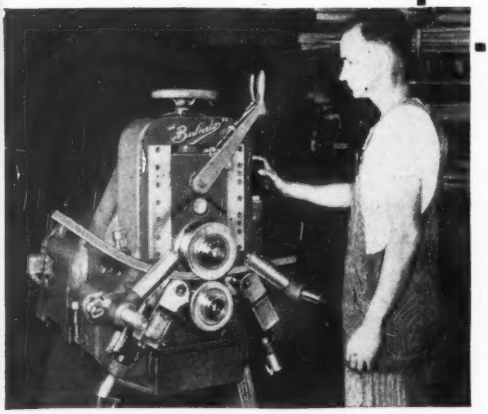
SKIL ELECTRIC Tools

SKIL Tools are made only by SKILSAW, INC.

No Cheaper Method of

Rolling Out Curved Shapes



than with

"Buffalo" BENDING ROLLS

Yes, you can make a production-line operation out of the once-slow job of turning out spirals, arcs, circles and special curved shapes! "Buffalo" Bending Rolls do it quickly and accurately. Little experience needed to operate them. Left, "Buffalo" OA Bender widely used in light metal industries. Large horizontal and vertical benders also available for forming larger shapes. WRITE FOR BULLETINS 352-B, and 344-A—and see how you can put real profit into your bending with these husky machines. They pay for themselves in a hurry!

"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

388 Broadway Buffalo, New York

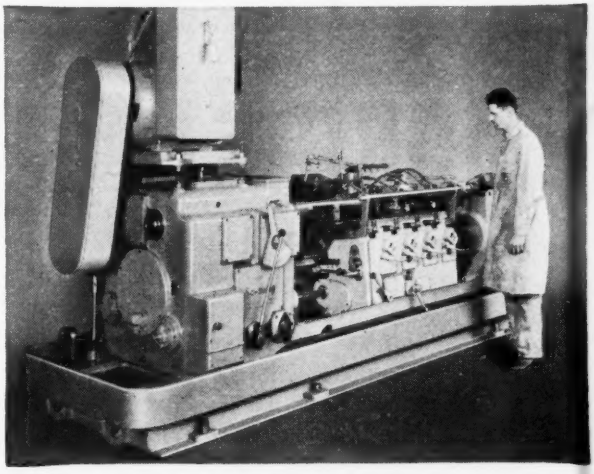
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK

MODEL "AP" Lo-swing LATHE MACHINES LECTRIC MOTOR SHAFTS



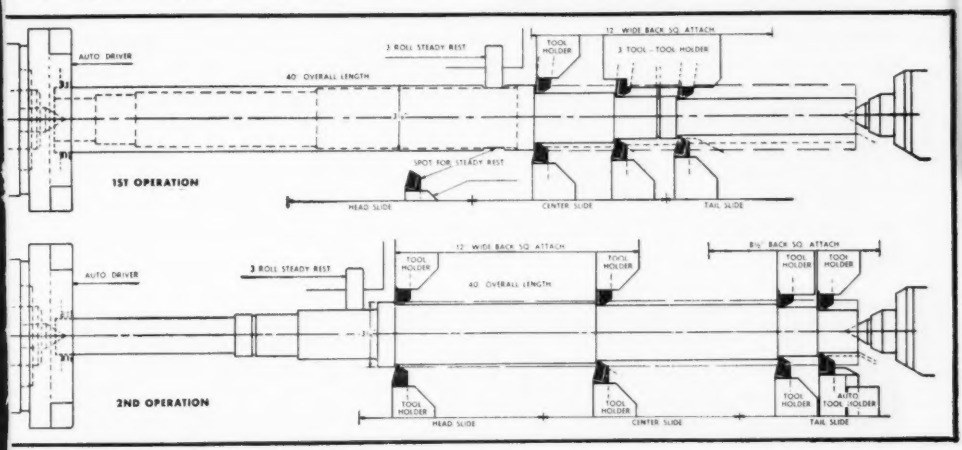
oblem: To rough turn, face shoulders d groove electric motor shafts machined small and medium size quantities.

lution: This new Lo-swing Semi-Autoatic Lathe, featuring *unlimited length of rriage travel thru rack and balanced in pinion carriage feed,* is ideal for maining short and medium run jobs ecomically. Unlimited carriage travel perts turning of short run jobs having long oulder lengths with simplified tooling; ultiple tooling may be used for long run os with short or long shoulder lengths. The drawings below show a typical two eration tool setup on electric motor afts which are being machined in small s. Only the one tool is being used for ning each diameter regardless of the length of cut. Machine setup is simplicity itself. First, the tool cks and tools are mounted on the tool slides in proper relation to each other and for the proper oth of cut. Secondly, two stops are set for controlg length of carriage travel in both directions and stop for positioning the carriage in relation to the work piece. The lathe is then ready for production.

Tool relief is automatic on the return stroke of the carriage and rapid traverse movements to and from the work are available by throwing a lever.

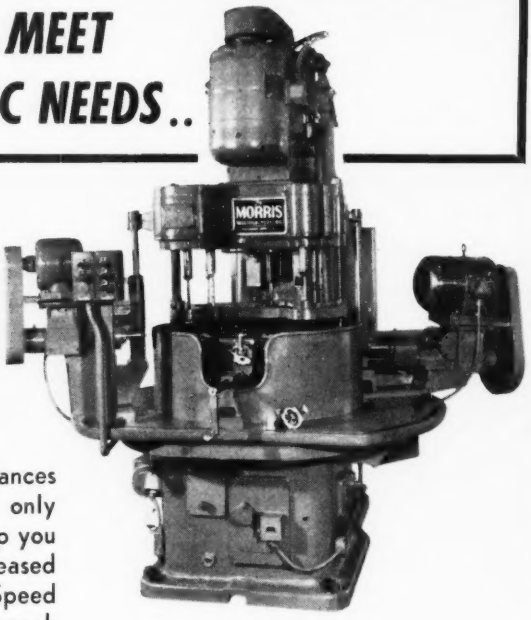
Investigate the many unique features of this new semi-automatic lathe.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.



PRODUCTION COSTS ARE LOWER WITH Lo-swing

DESIGNED TO MEET YOUR SPECIFIC NEEDS..



MORRIS

MOR-SPEED

PRODUCTION MACHINES

In a great many instances greater production is the only answer to rising costs. To help you meet this problem of increased costs Morris offers the Mor-Speed line of production machines each one engineered to meet your specific job needs. For example, the Hydraulic Vertical 6-station Automatic Indexing Drilling Machine has been designed for drilling, reaming, counterboring and spotfacing operations on housings for automobile oil pumps.

The machine is equipped with four vertical drill spindles—two vertical reaming spindles—one vertical counterboring spindle—one vertical spotfacing spindle and three horizontal drill spindles. Six hand clamp holding fixtures enable operator to load and unload machine easily and quickly at each indexing of machine.

If your work calls for multiple operations on high production jobs consult Morris. Morris has available the engineering skill—manufacturing experience and facilities to help you obtain greater production and lower costs from equipment designed to meet your specific needs.

Builders of MOR-SPEED Lines

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

Save TIME and MONEY in DIE BUILDING

with RB Interchangeable PUNCHES and DIES

RB punches and dies cut die-making costs because they permit use of standardized RB retainers which are quickly and accurately mounted. Completely interchangeable, RB punches, dies and their retainers eliminate large inventories and, unlike most parts used in die construction, have a salvage value.

Quickly and easily installed, yet securely locked both vertically and radially, RB punches and dies reduce press "down time" too, because they enable operators to make quick changes.

RB standard punches and dies are stocked for immediate delivery. Punches and dies of special sizes, shapes and materials are made promptly to your specifications.

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A 48 page book containing full information on Allied's "one stop service." Write for your copy.

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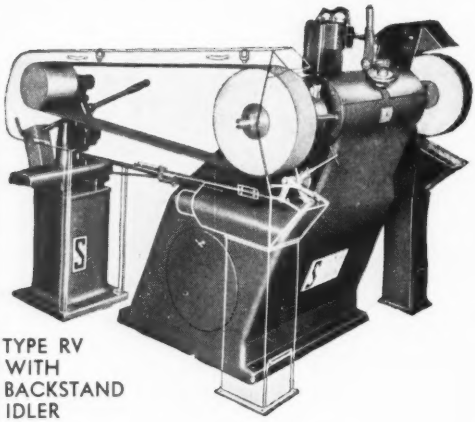
ECONOMY IN PRODUCTION

WHY NOT A MODERN GRINDING ROOM?



TYPE RV WITH BACKSTAND IDLER

PEAK EFFICIENCY

IN YOUR LIGHT OR HEAVY DUTY

SNAGGING GRINDING and POLISHING OPERATIONS!

SAVE TIME • SAVE MONEY . . .

The versatile STANDARD RV LATHE with BACK STAND IDLER provides substantial savings. The lathes are equipped with 4 heavy duty ball bearings run in oil, and a coincidental switch and brake. IDLER interchangeable for either right hand or left hand operation.

Buffing and polishing lathes available from 3 H.P. to 20 H.P. with speed ranges from 1500 to 3000 R.P.M. (other speed ranges available). Single and multiple speed machines available up to 60 H.P.

See this machine in operation at our Booth 1628 at the National Metal Exposition, Cleveland, Ohio, October 17-21.

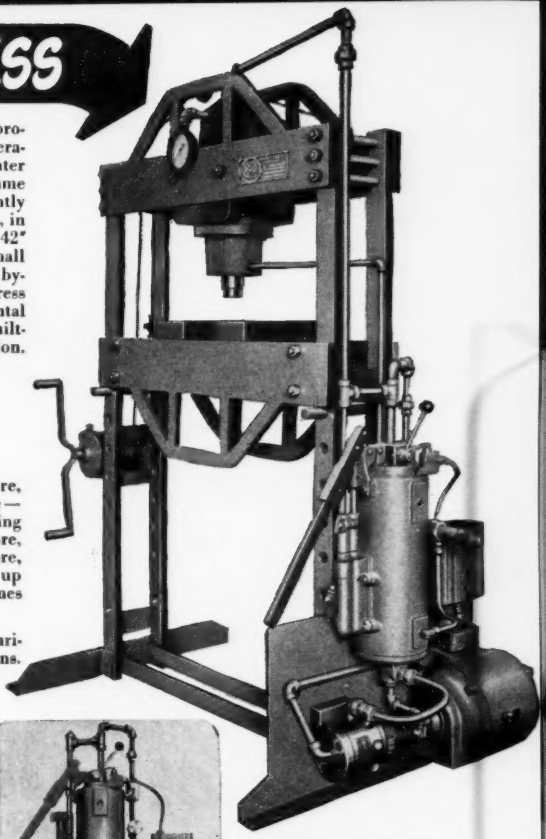
This set-up belongs in your shop! Write today for catalog 44.

THE STANDARD ELECTRICAL TOOL CO.

2487 RIVER ROAD **CINCINNATI 4, OHIO**

LOOK AT THIS PRESS

It's designed to provide industry with low-cost, high production units that are highly flexible in design and operation . . . relieving heavier presses of short runs and lighter work. Presses are practically fool-proof in operation. Frame is extremely rugged. Fingertip controls are conveniently located at hand level. Available for immediate delivery, in standard width (between uprights) of 24″—31″—36″—42″ respectively. Available in special width up to 72″ at small additional cost. Movable bed plates. Pumping unit has by-pass relief valve which can be set at any pressure up to press capacity. Presses available for either vertical or horizontal operation. *All Standard* presses equipped with 2-speed built-in hand pumps for more sensitive and versatile operation.



READ THESE "SPECS":

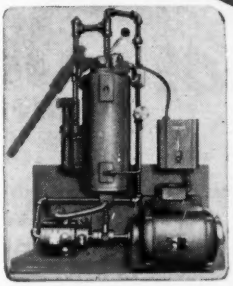
CYLINDERS: *Standard Models* furnished with 6" bore, 7½" stroke—spring return type; also 5" bore, 7½" stroke—spring return type. Above presses are *standard*. Following can be furnished at additional cost: Double Acting, 6" bore, 7" stroke; 6" bore, 11" stroke; 5" bore, 7" stroke; 5" bore, 11" stroke. Special long stroke cylinders also available, up to 48" in length, for incorporation in suitable press frames of our make.

PUMPING UNITS: These units can be supplied in various volumes and pressures, in a total of 13 combinations.

Presses include V blocks, Gauge, Motor Controls, Pressure Regulator, etc., complete and ready to attach to electrical source.

CHECK THESE USES:

There are so many everyday production uses for these versatile KRW Hydraulic Presses that we have lost count. Here are a few of the more obvious . . . blanking, forming, bending, broaching, straightening, stamping, embossing, numbering, upsetting, laminating, pressing and hot or cold forging. KRW Engineers are daily developing other uses. If you have only a vague idea of how these presses might be used in your plant, let us have it in a rough form. We'll do the rest.



MODERNIZE AND MOTORIZE YOUR PRESENT KRW PRESS with one of these compact motor drive units. They come complete ready to connect to your press. Require very little extra floor space. Write for conversion unit prices, giving the capacity and serial number of your press.

BEAT THESE PRICES*:

Depending upon capacity of pumping equipment, prices of Standard model motor driven hydraulic presses are as follows, F. O. B. Factory: 25-ton press from $727.00 to $992.00. 50-ton press from $806.00 to $1058.00. 60-ton press from $1070.50 to $1135.00. 75-ton press from $1198.00 to $1258.00. All motors in the above units are 220/440 volt, 3 phase, 60 cycle. Any change in motor specifications is extra. **Subject to change without notice.*

MAIL THIS COUPON

It will bring you all the money-saving facts about these low cost, high production hydraulic presses. Now is the time to get ready for the highly competitive days ahead.

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

Please send me complete information on KRW Motor Driven Presses as follows:

☐ 25-ton ☐ 50-ton ☐ 60-ton ☐ 75-ton presses

☐ motor drive conversion unit ☐ Press Cap.

Serial No. .....

Name .....

Address .....

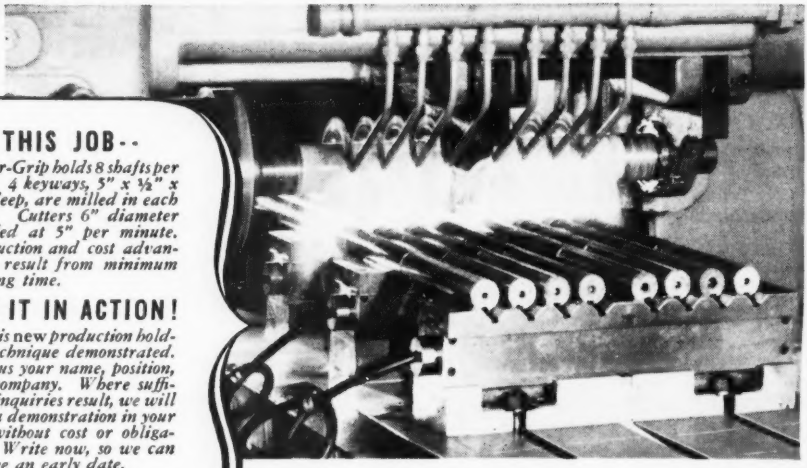
City and Zone ..... *State* .....

16

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.

LOOK - NO CLAMPS!



ON THIS JOB--

Power-Grip holds 8 shafts per load. 4 keyways, 5" x ½" x ¼" deep, are milled in each shaft. Cutters 6" diameter are fed at 5" per minute. Production and cost advantages result from minimum loading time.

SEE IT IN ACTION!

See this new production holding technique demonstrated. Send us your name, position, and company. Where sufficient inquiries result, we will plan a demonstration in your city without cost or obligation. Write now, so we can reserve an early date.

—With DEEP MAGNETIC PENETRATION A NEW PRODUCTION HOLDING TECHNIQUE

That's right! Power-Grip Holding, with its Deep Magnetic Penetration eliminates the need for complex, expensive, holding fixtures, and grips securely odd shaped pieces otherwise normally difficult to hold.

Applied to milling, turning, shaping, planing, or grinding operations, this *new* holding technique is used for stout, high speed machining cuts. Get the complete story today. Write for a copy of our latest Bulletin, Magnetic Holding Methods.

Send us prints and specifications for estimates on Power-Grip Holding for your Production Jobs

SUNDSTRAND MAGNETIC POWER-GRIP CHUCKS

SUNDSTRAND MAGNETIC PRODUCTS CO.
Division of Sundstrand Machine Tool Co.
1330 18th AVENUE • ROCKFORD, ILLINOIS

CUTS COST 50%

HAND files and scrapers were being used by this manufacturer of railroad equipment for filing sharp machine edges and burrs on bronze castings. The Rotor Application Engineer suggested doing it the easy way with a Rotor M-827 midget grinder with rotary file. This 20,000 R.P.M., 1¼ lb. Rotor air tool was installed and gave these results:

50% reduction in burring costs because high-speed, light-weight Rotor midget file doubles production compared to former hand operation.

A more uniform, smoother finish because this rotary power file is easy to handle and reaches places inaccessible with hand files.

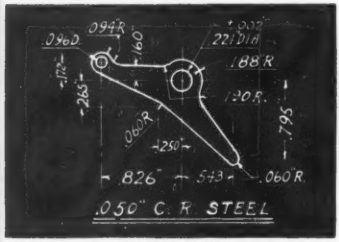
Perhaps you have hand filing operations which could be done quicker and better with these high-speed, light-weight tools. Let the Rotor Application Engineer suggest ways to decrease your costs by increasing your output per man per dollar.

Yours for smoother filing,
AIR O'TOOL

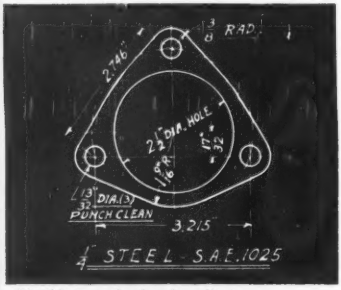
THE **ROTOR TOOL** CO.
CLEVELAND, OHIO

Profits from Metal Stampings in small lots
with LOWEST POSSIBLE COSTS

Blanking and piercing first 100 pieces $21.60
Blanking and piercing each subsequent 100 pieces $2.60



Blanking and piercing first 100 pieces $26.40
Blanking and piercing each subsequent 100 pieces $2.40



Blanking and piercing first 100 pieces $40.00
Blanking and piercing each subsequent 100 pieces $5.00

No other method of producing duplicate die-cut stampings in small lots equals the patented process now used by the Dayton Rogers Manufacturing Company. Your stamping requirements can be met quickly, accurately and economically, no matter how small a quantity.

Die-cut stampings of practically any size or shape, from any material, can be blanked, formed and drawn. All working tolerances are rigidly adhered to, assuring accurate, uniform duplication throughout each die-cut lot.

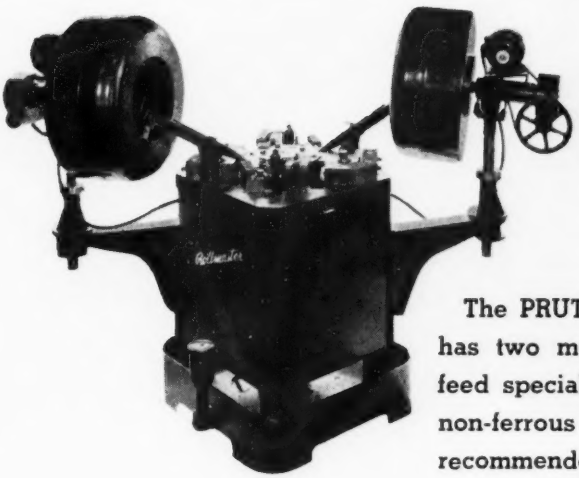
Send us a blueprint or sample for our quotation. No obligation.

Visit Our
Booth Number 2107
National Metal Exposition

DAYTON ROGERS
Manufacturing Company

MINNEAPOLIS 7, MINNESOTA

The PRUTTON *Rollmaster*



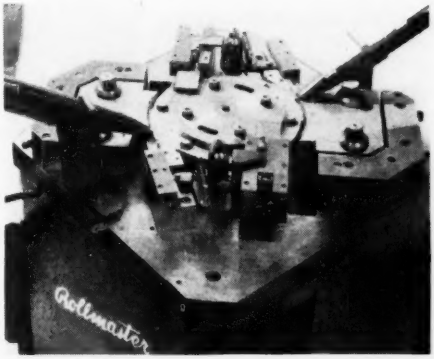
Capable of Producing 25,000 pieces per hour

The PRUTTON ROLLMASTER has two motorized hoppers that feed special parts of ferrous and non-ferrous metals. Single feed is recommended with production output of 25,000 per hour.

● This new Prutton advanced Model Automatic Machine is designed for accurate thread rolling—and is capable of meeting enormous production schedules.

The simple operation of the machine enables an unskilled worker to quickly learn the machine and maintain the production pace of the unit.

Write today for further information about this new machine.



D. H. PRUTTON MACHINE & TOOL CO.

3731 W. 139TH ST. CLEVELAND 11, OHIO

FLAME HARDENED JAW WAYS

FOR LONGER EFFECTIVE CHUCK LIFE

Horton engineers have taken the wear out of the chuck's most vulnerable point . . . the jaw way. The ways of your lathe are hardened to give you long, accurate life. This same hardening process is now used by Horton to **prolong** your chuck's initial **accuracy** and **gripping power** — two highly important factors in chuck operation.

To further assure maximum life and dependability Horton uses only the finest alloy steel; all parts are properly heat treated for toughness; exacting inspections at five different stages of assembly are standard procedure. The **Flame-Hardened Jaw Way** is but one more reason for choosing Horton Chucks.

Write today for a copy of the new Horton catalog.

The E. HORTON & SON Co.

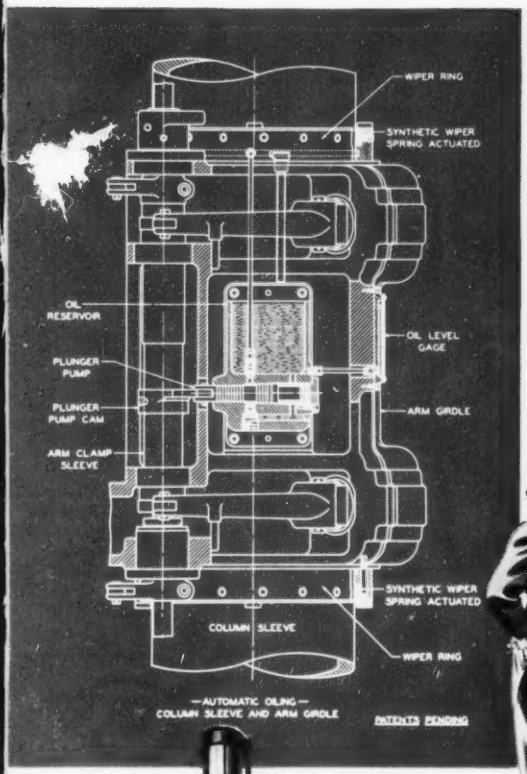
WINDSOR LOCKS • CONNECTICUT

HORTON Since 1851 CHUCKS

Just a memory now

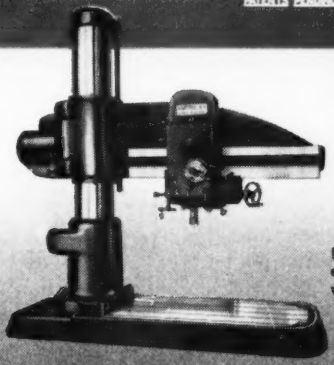
Column Scoring a thing of the past...

We've done something about it—



On the new "AMERICAN" Hole Wizard Radial the arm girdle and its mating column area are automatically oiled and cleansed. Actuation of the elevating lever operates a plunger pump in the arm girdle forcing oil into the distributing reservoir at the top which lubricates the entire arm girdle area. Abrasion and oil resistant synthetic wipers at top and bottom trap the oil to prevent leakage and thoroughly cleanse the column of all dirt and foreign matter ahead of the arm girdle when raised or lowered.

This positively reduces the danger of column scoring to an absolute minimum — just another "Hole Wizard" feature that insures long life and dependable service.



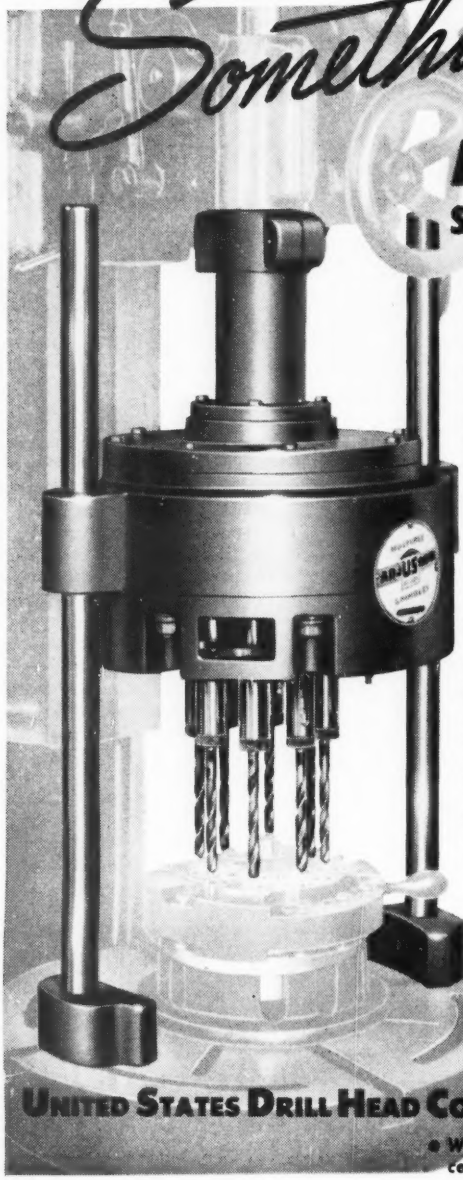
Bulletin No. 327 describes this and other exclusive "Hole Wizard" features of proven value. Want one?

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Something NEW!



ADJUSTAFIX MULTIPLE SPINDLE DRILL HEAD

THE head is designed to reduce drastically multiple drilling costs by eliminating expensive changes in set-up from job to job.

As much as 90% of the drill head can be left intact, yet a complete engineering change-over is accomplished by simply changing the drill pattern plate and relocating spindles on the new pattern plate to conform to the new design. The number of drill patterns possible with the ADJUSTAFIX MULTIPLE SPINDLE DRILL HEAD is limited only by the number of pattern plates available.

The spindle and idler constructions are entirely separate assemblies both being self contained. For this reason, the use of compound gears on the idler shaft gives exactly the tool speed required for a given job. No change of gearing is necessary in the main drive box when tool speed is changed.

THE ADJUSTAFIX MULTIPLE SPINDLE DRILL HEAD can be installed easily on the machines you are now using, and can be used not only for drilling, but for tapping, reaming, spot-facing, boring, counter-boring, and milling operations as desired.

ALL ADJUSTAFIX MULTIPLE heads have fully automatic lubrication for either horizontal or vertical operation.

US HEADS

SINCE 1915

UNITED STATES DRILL HEAD CO., 616 BURNS STREET, CINCINNATI 4, OHIO

We manufacture all types of multiple spindle, fixed center, adjustable and lead screw tapping heads.

8 Million grinds per year on 450 different set-ups ...cost less than *½¢ per grind*

Volume production of precision parts at lowest cost is a *must* at Felt & Tarrant Mfg. Co., makers of the Comptometer. Use of Dumore Grinders for production has been a logical development, checked every step of the way by both the production and cost departments.

Permanent set-ups cut labor cost

Noting Dumore performance on tool room and maintenance jobs, Production tried them on the line, found them ideal from cost, accuracy and output standpoint. At present, they are using twenty-one Series 44's and nine older models. The set-ups average $25 apiece, are simple and permanent, permit use of unskilled labor. Total investment for the 450 individual set-ups is only $3,300 for Dumore Grinders and $11,000 for special mounting fixtures. Model changes, requiring new parts, are simply taken care of by building additional low-cost fixtures.

Dumore costs 1½¢ per hour to own

On a typical operation, Dumore, plus fixture depreciation, power, maintenance and supplies cost Felt & Tarrant only 34¢ per hour. Part, requiring 5 grinds, costs only 2¢ per unit, including labor.

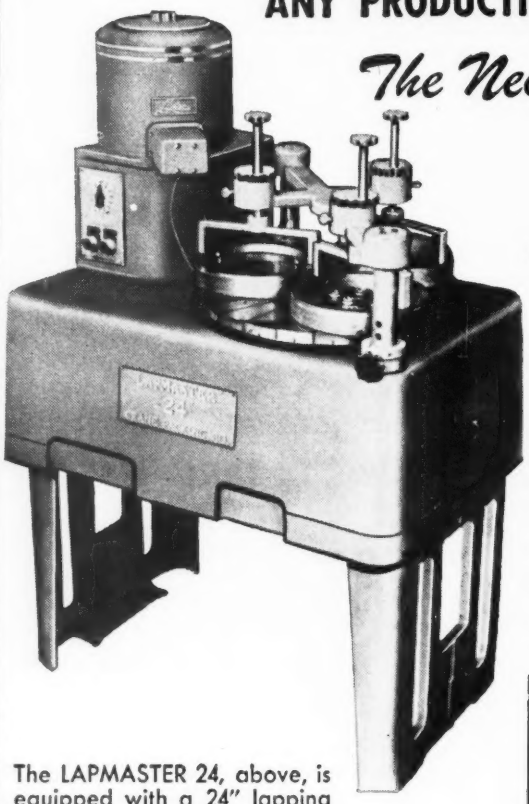
Why not examine your grinding operations with an eye to incorporating Dumore economies. Your Dumore Dealer will be glad to recommend installations, and, if you wish, arrange for free demonstration in your plant. Call him, or write: The DUMORE COMPANY, Dept. K-33, Racine, Wisconsin.

DUMORE

DG-2

PRECISION LAPPING FOR ANY PRODUCTION NEED WITH

The New JOHN CRANE *Lapmaster* "24"



The Lapmaster is a revolutionary development in modern lapping methods—featuring a self-conditioning, adjustable lapping plate which can be set for automatic cycling. Precision surface finishes and flatness to millionths of an inch are readily attained on a production basis by unskilled operators.

The LAPMASTER 24, above, is equipped with a 24" lapping plate; has overall dimensions of 29"x44"x57½"; will lap parts up to 9¾" in diameter. Lapmasters are manufactured with lapping plate diameters of 12", 24", 36", 48", 60" and 72".

Write for Free Illustrated Descriptive Booklet

Be Sure to See
THE LAPMASTER
at the
CLEVELAND METAL SHOW

Lapmaster Models will be operated to show you production precision lapping "first-hand."

Booth 836
MAIN EXHIBITION HALL

CRANE PACKING COMPANY
1805 Cuyler Avenue **Chicago 13, Illinois**

Why it pays to *Call us* when you need Alloy Steels

THERE are three major reasons why it's to your advantage to "Call Us" for all your alloy steel requirements:

1. **You're sure that your orders will be filled quickly and efficiently.**
2. **You're sure of getting steels that are manufactured to a *Guaranteed Minimum Hardenability*.**
3. **You get a valuable metallurgical service. This means that you get a Heat Treatment Guide with *each* shipment, containing specific data on the composition, potential physical properties and recommended heat treatment temperatures. This helps you get the maximum performance from U·S·S Carilloy Steels supplied on your orders.**

Yes, it pays you to "Call Us" when you need alloy steels. Our nearest warehouse or sales office is constantly at your service. So, phone, wire or write for prompt action. Meanwhile, your requests for literature will receive immediate attention. Just fill in and return the coupon. There's no obligation.

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Warehouses: BALTIMORE · BOSTON · CHICAGO
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USS

UNITED STATES STEEL

UNBRAKO

The Knurling

SAVES TIME...

ASSURES A SLIP-PROOF GRIP, EVEN WITH OILY, GREASY FINGERS

There is a definite saving of assembly time when you use "UNBRAKO" Socket Head Cap Screws. The exclusive knurled heads perform triple duty: (1) the *knurling* provides a sure, slip-proof grip; (2) the *knurling* speeds assembly, because it enables the "UNBRAKO" to be screwed in faster and further with the fingers—handiest of all wrenches—before a "key" becomes necessary; (3) the *knurling* permits positive locking—a feature so often essential where there is excessive impact or vibration. As always, the brand name "UNBRAKO" signifies *extra strength* and *precision manufacture to close tolerances*

"UNBRAKO" *Knurled* Socket Head Cap Screws are available in both National Coarse and National Fine Thread Series in a full range of standard sizes. Other sizes to special order. Our "UNBRAKO" Catalog gives you further details—write for it and for the name of your nearest "UNBRAKO" Distributor.

Knurling of Socket Screws originated with "Unbrako" in 1934.

OTHER POPULAR "UNBRAKO" PRODUCTS

"UNBRAKO" *Knurled* Cup Point or *Knurled* Thread Self-Locking Socket Set Screws; "UNBRAKO" *precision-ground* Dowel Pins . . . of hardened alloy steel; "UNBRAKO" *fully-formed* Pressure Plugs . . . in either regular or "Dryseal" types.

Socket Head Stripper Bolt with Knurled Head

Stripper Bolt or Shoulder Screw—precision ground for maximum accuracy.

Socket Set Screw with Plain Cup Point

For use where Self-Locking is not necessary, the "UNBRAKO" Socket Set Screw with *plain cup point* has proved highly satisfactory. Sizes available from #4 to 1½" diameter, in a full range of lengths.

Flat Head Socket Cap Screw

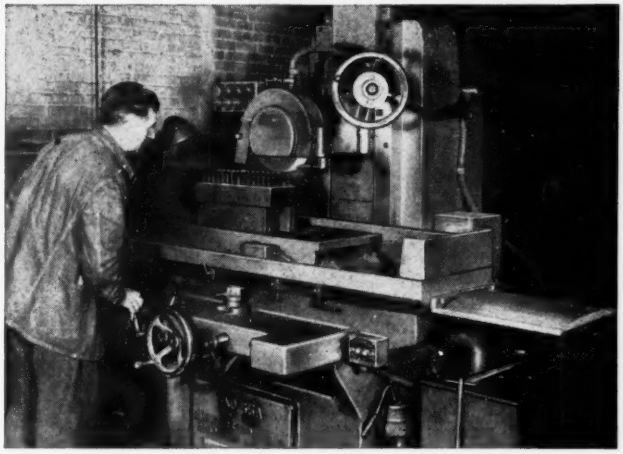
The "UNBRAKO" Flat Head Socket Cap Screw is representative of the popular "UNBRAKO" Internal Wrenching feature . . . and of "UNBRAKO" *extra strength* and *precise close tolerances*. Available in sizes from ¼" to 3" diameter, in a full range of lengths.

SPS **STANDARD PRESSED STEEL CO.**

BOX 556, JENKINTOWN, PENNSYLVANIA

"Serving industry continuously since 1903 through Industrial Distributors"

Enthusiastic Customers do our BEST advertising



True Temper Corporation, manufacturers of True Temper Products, use fourteen Grand Rapids Hydraulic Feed Surface Grinders in ten of their factories. The machine shown is a 55A.

You will appreciate the micro-inch finish produced at production speeds on Grand Rapids Grinders. All Grand Rapids Hydraulic Feed Surface Grinders have these outstanding features:

1. **One-piece column and base casting for vibrationless rigidity**
2. **Precision ball-bearing spindle which is greased for life**
3. **Bijur one-shot lubrication system eliminating hand oiling**
4. **Patented vertical movement of wheel head for quick, accurate adjustments**
5. **Portable coolant tank for ease of coolant replacement**
6. **Vane type hydraulic pump for fast longitudinal table travel**

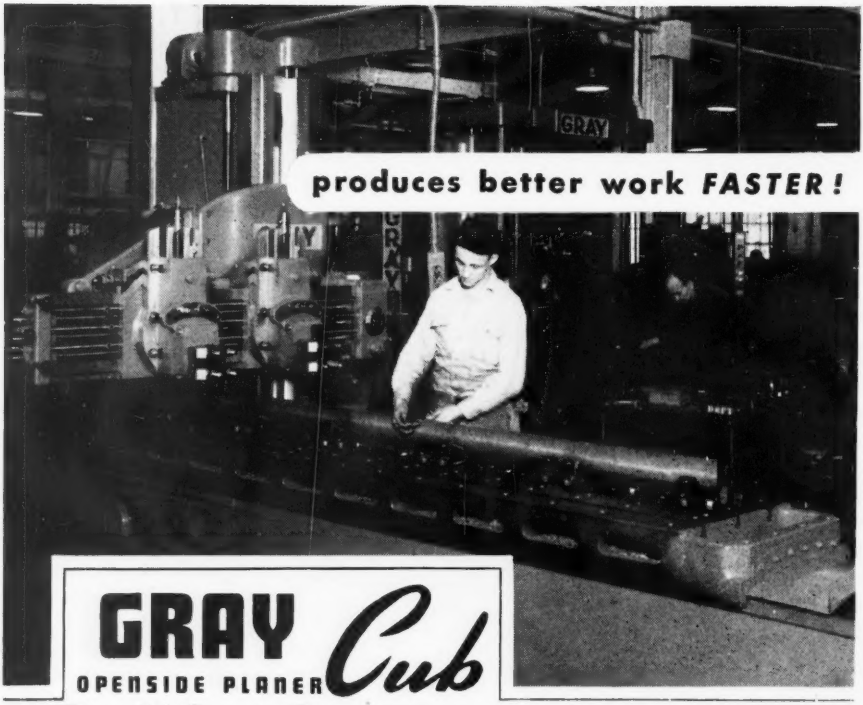
to serve you—

Your inquiry concerning your specific grinding needs will receive prompt attention. Grand Rapids Grinders include: Hydraulic Feed Surface Grinders, Universal Cutter and Tool Grinders, Hand Feed Surface Grinders, Drill Grinders, Tap Grinders, and Combination Tap and Drill Grinders.

GRAND RAPIDS GRINDERS

GALLMEYER & LIVINGSTON COMPANY

308 Straight, S. W., Grand Rapids 4, Mich.



produces better work *FASTER!*

GRAY *Cub*

OPENSIDE PLANER

"A Bear for Production"

A *Little* PLANER THAT MAKES *Big* SAVINGS

1. The planer for Carbide Tools—cutting and return speeds up to 300' per minute.
2. Speed of cut and return instantly adjustable from operating position.
3. Table started in either direction, reversed, "inched," or stopped from pendant switch.
4. Single-Shift power rapid traverse controlled at the heads or from either end of rail.
5. Space Saver Drive, with Full Floating Drive Shaft.
6. Non-Metallic Table Ways eliminate scoring.
7. Loop Lubrication. The only adequate system for high speed reciprocating tables.
8. Mechanical non-shock tool lifters.
9. Side head feed independent of rail heads.
10. Built in 24", 30" and 36" sizes.

WRITE FOR FULLY ILLUSTRATED DESCRIPTIVE BULLETIN No. 55

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

No Other Blade Offers You Higher Performance, Lower Sawing Costs

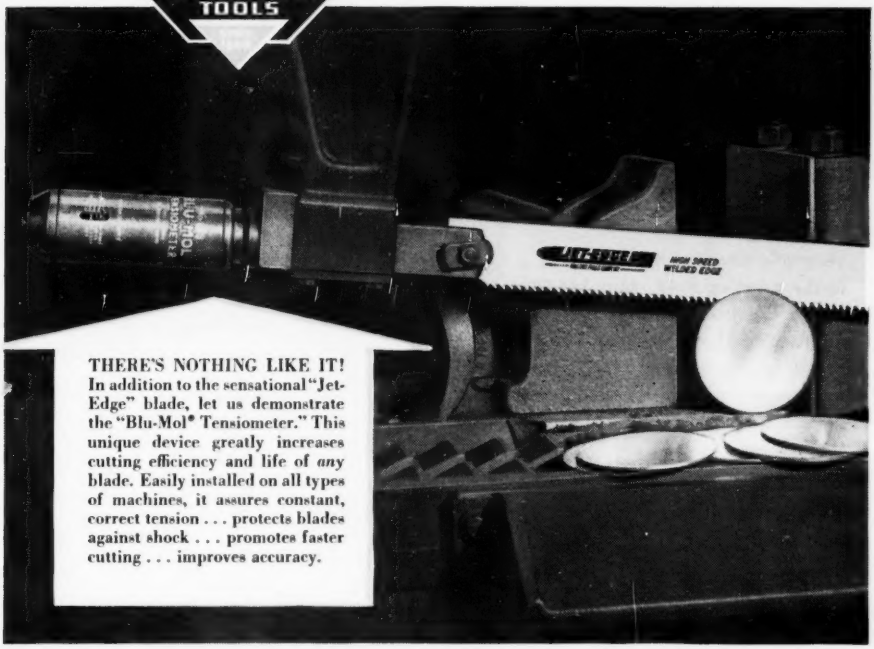
When a hack saw blade promises to cut sawing cost 20% to 50% and *delivers what it promises*, it's bound to find ready acceptance *fast*. That's the story of the Millers Falls "Jet-Edge" — the greatest performer in the history of machine blades.

"Jet-Edge" has already proved itself in metalworking plants throughout the country. It's rugged, unbreakable, safer to use. Customers tell us it outperforms the best blades they've ever tried. The super high speed edge welded to an extra strong back is the reason why "Jet-Edge" stands up, even under toughest cutting conditions.

For a real revelation in economy and performance, let us give you a "Jet-Edge" demonstration on your own work and in your own hack saw machines. We're sure you'll find it's an eye-opener to actually see what this amazing blade can accomplish. Just write, suggesting a date, and we'll be there. No obligation, of course.

MILLERS FALLS COMPANY • GREENFIELD, MASSACHUSETTS

MILLERS FALLS TOOLS



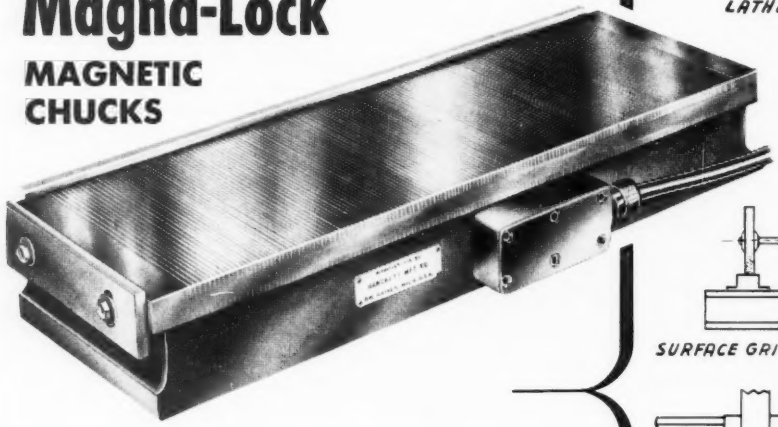
THERE'S NOTHING LIKE IT! In addition to the sensational "Jet-Edge" blade, let us demonstrate the "Blu-Mol® Tensiometer." This unique device greatly increases cutting efficiency and life of *any* blade. Easily installed on all types of machines, it assures constant, correct tension . . . protects blades against shock . . . promotes faster cutting . . . improves accuracy.

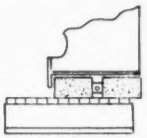
MILLERS FALLS "JET-EDGE"® BLADES

Plenty of "PULL" for

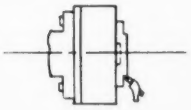
Heavy Machining Magna-Lock

MAGNETIC CHUCKS





ROTARY GRINDING



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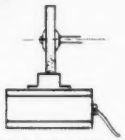
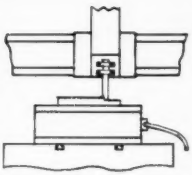
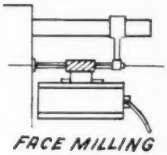


SURFACE GRINDING



PLANING



FACE MILLING

END MILLING

Magnetic chucking has long been a time and money saver in the grinding field. Now MAGNA-LOCK—with its laminated top plate construction and *extra* holding power—offers you all the advantages of magnetic chucking for *heavy machining* operations. Because it does away with ordinary, time-consuming chucking methods, MAGNA-LOCK will usually double the output on the lathes, planers, mills, shapers, etc., you already have.

Write Dept. MM-109 today for full details of how other manufacturers are saving time and money with magnetic chucking.

Hanchett

MAGNA-LOCK CORPORATION

Magnetic Chucks and Devices

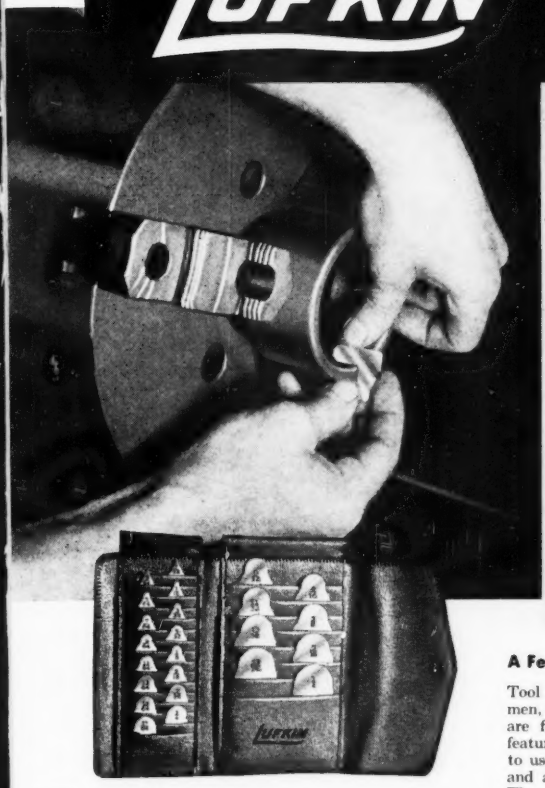
P. O. BOX 816 **BIG RAPIDS, MICHIGAN**

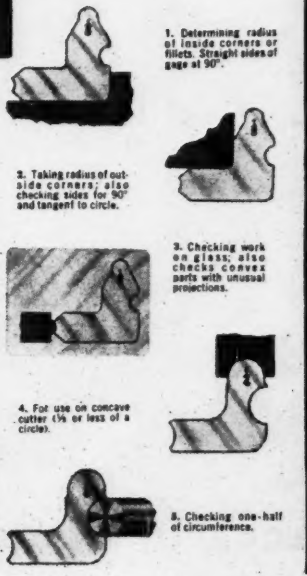
A New Principle in Radius Gages

PIONEERED BY

LUFKIN

. . . providing 5 applications for each radius




1. Determining radius of inside corners or fillets. Straight sides of gage at 90°.
2. Taking radius of outside corners; also checking sides for 90° and tangent to circle.
3. Checking work on glass; also checks convex parts with unusual projections.
4. For use on concave cutter (⅛ or less of a circle).
5. Checking one-half of circumference.

HANDY KIT FOR EASY USE

Each blade (or gage) is a separate unit carrying corresponding external and internal forms—thus most conveniently and accurately applied to the work. Offered in 5 different sets in durable red leatherette kit, with pockets protecting against loss of blades and making selection easy. Range of blades from $\frac{1}{64}$ to 1 inch.

A Few of the Many Uses Are Shown Above

Tool and diemakers, pattern makers, templet layout men, screw machine operators and other mechanics are finding that the exclusive "Five Application" feature of Lufkin Radius Gages makes them easier to use and opens up a far wider range of usefulness and accuracy than is possible with ordinary gages. These advancements in Radius Gages typify the superior design and features which distinguish all of the many hundreds of Lufkin precision measuring devices. Lufkin Precision Tools, Tapes and Rules make accuracy easy, fast and sure.

Write Dept. MM for fascinating booklet, "The Amazing Story of Measurement." Enclose 10c (no stamps) to cover handling and mailing.

THE LUFKIN RULE CO.

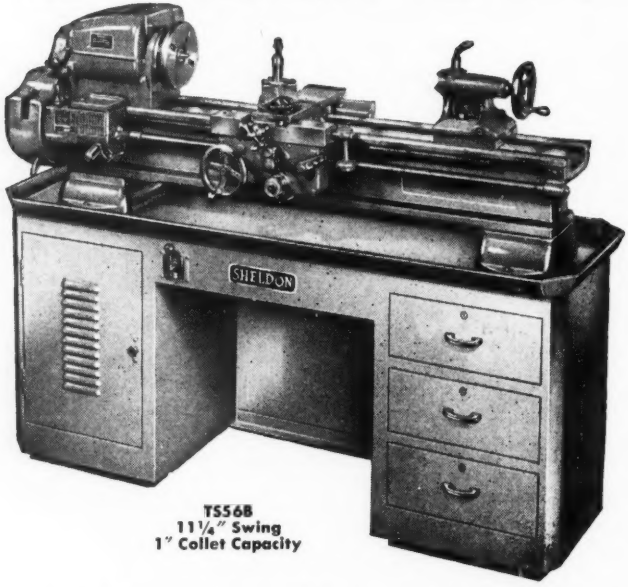
Saginaw, Michigan
New York City
Windsor, Canada

Buy LUFKIN

PRECISION TOOLS • TAPES • RULES

FROM YOUR DISTRIBUTOR

SHELDON



TS56B
11¼" Swing
1" Collet Capacity

Accuracy is a matter of Tolerances *not Size*

There may have been a time when to be accurate a lathe had to be massive, cumbersome and expensive. That is not true today.

Accuracy is essentially a matter of tolerances not mass, and today the very finest of spindle bearings (Timken's Zero Precision Tapered Roller Bearings—run out accuracy within .00015) are found on SHELDON Precision Lathes. Beds of these 10", 11" and 12" SHELDON Lathes are held to within .0005" per foot of both parallel and longitudinal alignment while the lead screws are held within a tolerance of lead error of .0005" in any inch. Rigidity is obtained by improved engineering—by placement of mass rather than sheer bulk.

Advances in machine tool building art, special machines, jigs and fixtures produce uniformly excellent SHELDON Precision Lathes in quantities that permit low selling prices. Larger collet capacities and increased power at the cutting point enable these more-profitable-to-operate lathes to take over much work heretofore requiring larger and more costly equipment.

WRITE FOR CATALOG

SHELDON MACHINE CO. Inc.

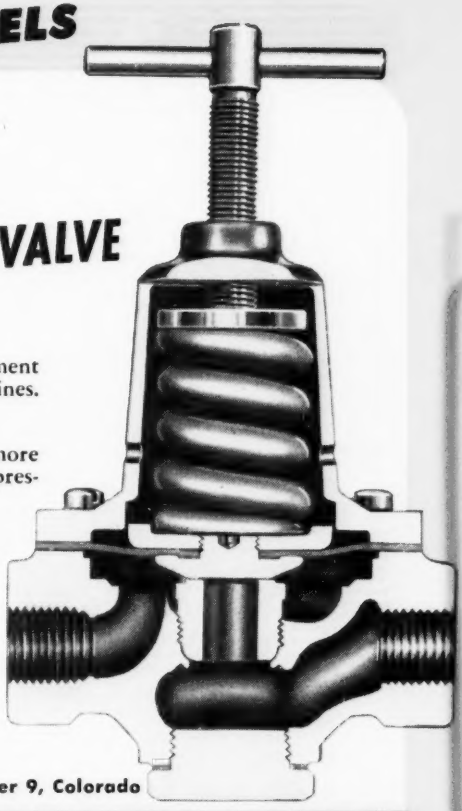
Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4250 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

REACH NEW PERFORMANCE LEVELS

with this

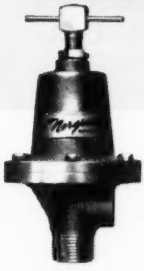
New NORGREN Diaphragm Type RELIEF VALVE



1. Automatically prevents damage to equipment through built-up pressures in air and fluid lines.
2. Holds its Relief Pressure setting.
3. Large, exposed diaphragm area provides more positive valve action for large flow at low pressure rise.
4. Metal-to-Metal Valve Seat for pressures up to 250 p.s.i. and for more rugged service. Streamlined profile provides better flow conditions and withstands shock loads for longer life.
5. Also available with Rubber-to-Metal Seat for high sensitivity and positive seating with pressures up to 125 p.s.i.
6. Six pipe sizes from ⅛" to 1".

C. A. Norgren Co., 222 Santa Fe Drive, Denver 9, Colorado

Other NORGREN RELIEF VALVES FOR A WIDE RANGE OF REQUIREMENTS!



General Purpose, Low-Flow Valve—No. 61A2. Small, inexpensive, low capacity relief valve used for many purposes. 5 to 250 p.s.i. ¼" only.

Water Relief Valve—No. 475. Full floating, stick-proof valve. Rust proof parts. ½" and ¾".

Diaphragm Type for Hot Water and Air Tanks—No. 466. For pressures up to 250 p.s.i. Brass and bronze construction. ¼" inlet; ½" outlet.

Norgren

Lubricators, Regulators, Filters, Valves, Hose Assemblies, and Other Air Controls

Now . . . you can save up to 60% or more on production time with the Oliver Diemaker. The old hand method of making dies and gauges is obsolete. The Oliver Diemaker is faster . . . more accurate and will pay for itself in a short time.

Write now for complete information.

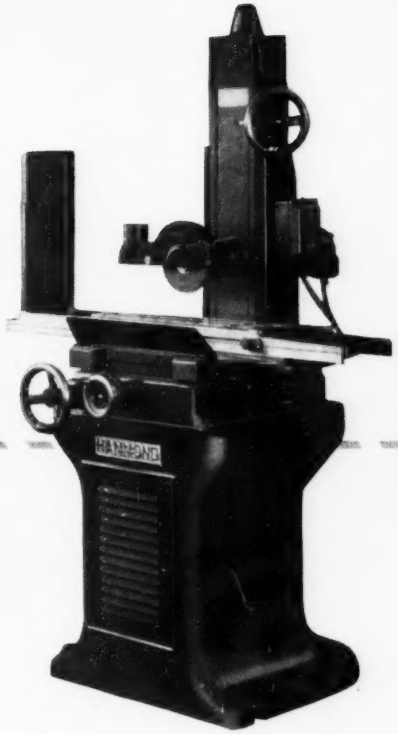
The two models shown here are the Bench Model S-1 which is a single speed Diemaker for use with tool steel up to 1" thick. The Heavy Duty Model has 6 speeds, works in metal up to 3" thick, has variable stroke to 5 inches, plus hydraulic feed.

OLIVER INSTRUMENT CO.

1430 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

ACCURATE GRINDING FOR SMALL TOOLS



- Heavy Vibrationless Construction.
- Smooth Roller Chain Table Drive for longitudinal travel.
- Double Dovetail Spindle Carrier Ways.
- Self Adjusting Spindle Raising Nut.
- Vernier Attachment for Vertical Adjustment.
- One-Shot Pressure Lubrication System.

● The Hammond No. 2, 6" x 18", Surface Grinder is a precision tool room machine for use on the most accurate gauge and tool work.

The standard spindle is direct motor driven and is mounted on precision pre-loaded ball bearing. Total vertical adjustment is 10¾". In and out movement of the table is 6½" with a longitudinal travel of 18".

Write or wire for further information.

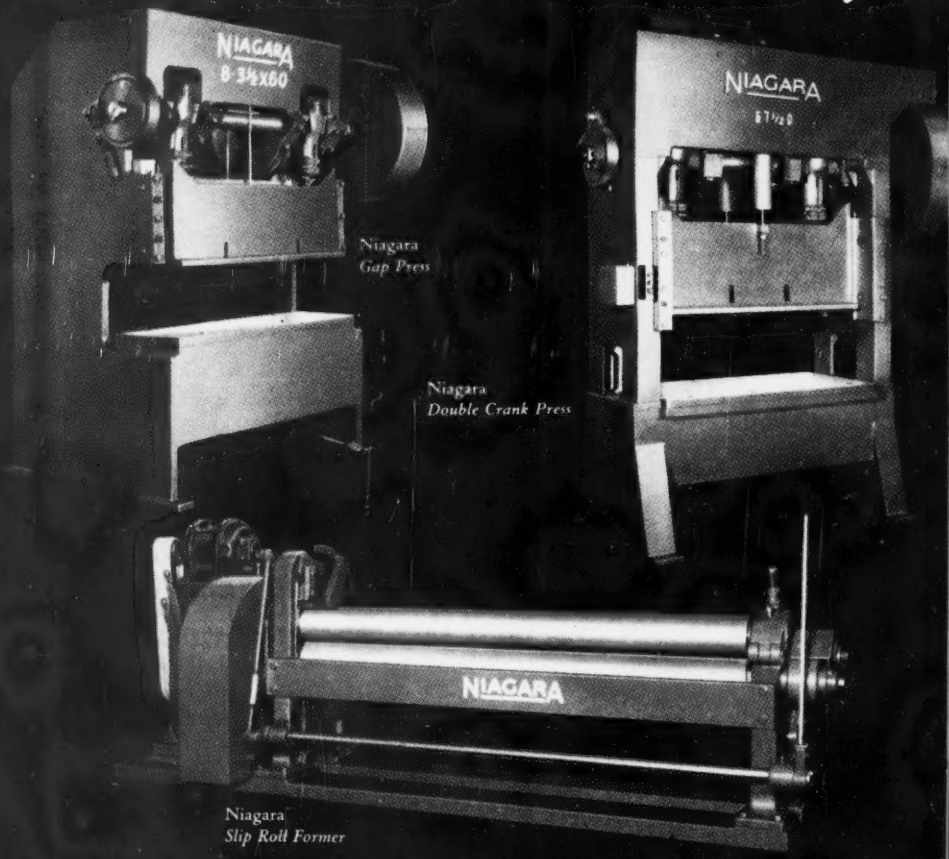
THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building

FOOTBURT-HAMMOND
A TIME TESTED LINE OF MACHINE TOOLS

SURFACE GRINDER

NIAGARA

PRESSES, SHEARS, TINNERS TOOLS *for*



Niagara
Gap Press

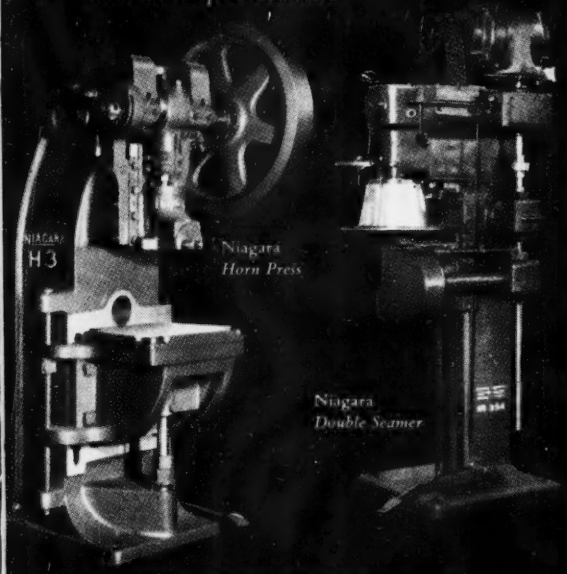
Niagara
Double Crank Press

Niagara
Slip Roll Former

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, N.Y.

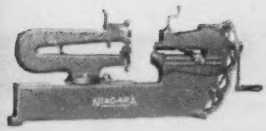
RA MACHINES *and* SHEET METAL WORK

Operations including shearing, blanking, punching, forming, flanging, beading, corrugating, seaming and many others are being done quickly, economically and accurately on Niagara machines. Niagara machines and tinners tools on these pages are just a few of the hundreds of types, sizes and capacities which make Niagara America's most complete line. Write for helpful bulletins.



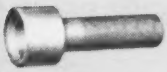
Niagara
Horn Press

Niagara
Double Seamer



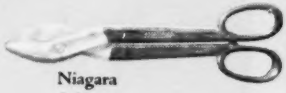
Niagara
Ring and Circle Shear

Niagara
Rivet Set and Header

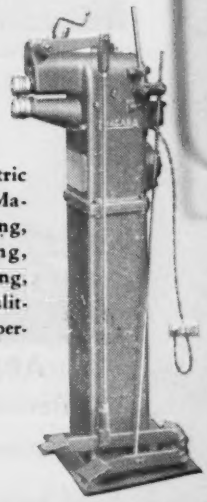


Niagara
Hollow Punch

Niagara
Foot Gap Shear

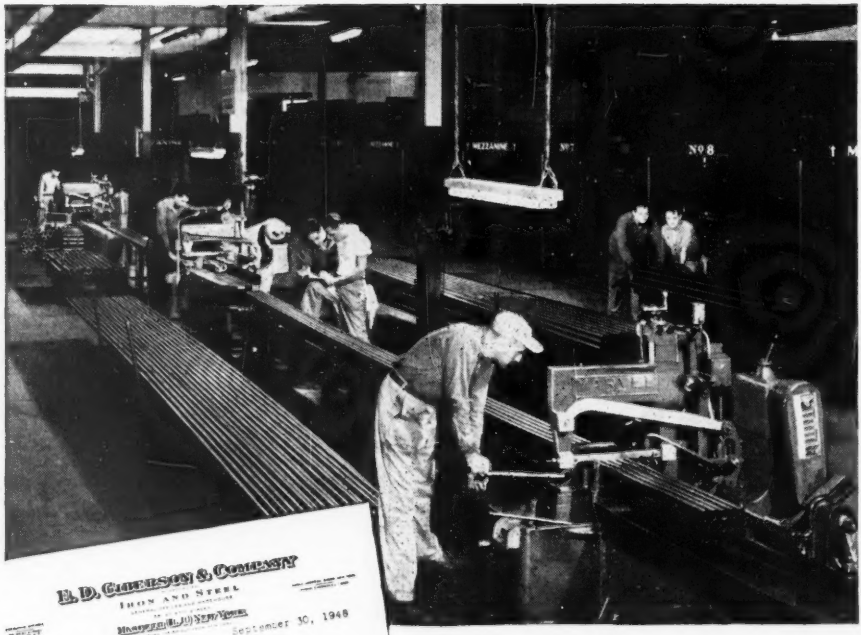


Niagara
Snips



● **Niagara Electric Combination Machine for burring, turning, wiring, beading, crimping, elbow edging, slitting and other operations.**

District Offices: Detroit, Cleveland, New York



E. D. GIBERSON & COMPANY
IRON AND STEEL
Hanover Bldg. New York

September 30, 1948

Armstrong-Blum Manufacturing Co.,
Chicago, Illinois

Gentlemen:

For almost half a century we direct distributors of Boiler Tubes, Condenser Tubes in seamless steel, electric welded steel and stainless steel, as well as seamless steel Pipe, Mechanical Steel Tubing, Seamless Steel Pipe, Stainless Steel Pipe and Tubing, we have cut in our warehouse many million feet of Tubular Steel Products.

The nature of our business necessitates both speed and accuracy in multiple cutting to exact lengths required by customers. When we decided recently to install three more 9A MARVEL Heavy Duty Automatic Hack Saw Machines, it was with full knowledge of their efficiency.

We can assure you of our entire satisfaction with their operation and regard them as valuable additions to our equipment.

Yours very truly,

E. D. GIBERSON & COMPANY, INC.

E. D. Giberson

President

Another Tubing Warehouse "Goes MARVEL"

Warehouses that are not equipped with proper sawing machines find that the cutting of steel tubing (especially the stainless types) is a difficult and costly job. But E. D. Giberson & Company, New York, have cut off millions of feet of all types and sizes of steel tubing to accurate lengths, economically and without difficulty, due to the fact that they have long been properly equipped with MARVEL SAWS. And because they have found MARVEL SAWS so trouble-free, so reliable, so economical to operate and so universally suited to all their cutting-off jobs, they have recently added this row of three new MARVEL No. 9A Automatic Hack Saws. With this additional equipment, they have expanded their facilities and can more promptly serve their fast-growng list of satisfied customers with steel tubing of all types and sizes, "cut to customer's specified lengths."

The local MARVEL Field Engineer will be glad to study your range of cutting-off work—whether it be in pipe, structural shapes, bars, or the toughest and largest alloy billets—and will then make recommendations on how you can improve your cutting-off operations to reduce costs and increase man-hour output.

• •

Just write us on your letterhead: "Without cost or obligation on our part, send your local Field Engineer to look over our cutting-off operations."

MARVEL *Metal Cutting* SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE • CHICAGO 30, ILLINOIS

THE TOOL THAT IS NEVER IDLE!

MATCO UNIVERSAL DIVIDING COLLET HEAD

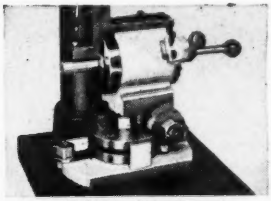
Precision Indexing .003 Tolerance

For precision milling and grinding angles, flats, tapers, hexagons and keyways. Hardened and precision ground 24 acme teeth index plate 90° vertical setting angle. Takes 5 C collets up to 1" capacity. Base 4¾" x 7½"; height 5" to center; weight 20 lbs.; extra division plates to 36 spacings.

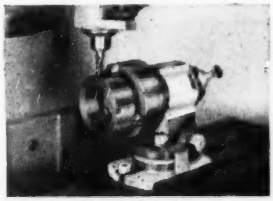
EXTRA FEATURES

- Tail Stock for Accurate Centering
- Lever action Collet closer
- Tap Grinding

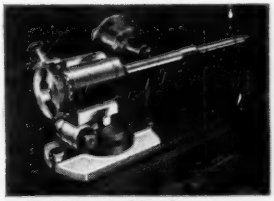
Write FOR CATALOG



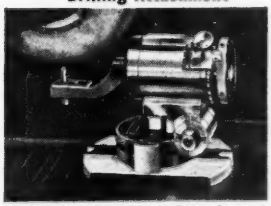
Drilling Attachment



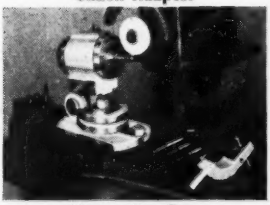
Chuck Adapter



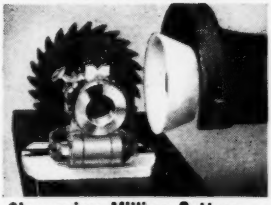
Tail Stock Attachment



Radius Dressing Attachment



Sharpening Taps



Sharpening Milling Cutters

MATCO TOOL COMPANY

2830-36 West Lake Street **Chicago 12, Illinois**

Est. 1934 . . . *Mfrs. Complete Line Precision Vises and Wheel Dressers*

has your shop got the "TOOL ROOM TROTS?"

How much time is wasted "on the road" while punch press operators and set-up men go back and forth to the tool room to get punches and dies for a short run set-up?

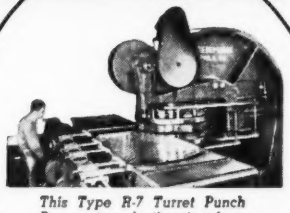
SEE A WIEDEMANN

With a Wiedemann Turret Punch Press, the operator remains at the machine . . . no need to make numerous time consuming "trips," since 12 to 32 punches and dies are carried in the turret . . . ready for instant piercing . . . always at the operator's fingertips. In addition, a Wiedemann saves you hours of layout time. On some machines, layout time is completely eliminated because of material handling gauge tables that position the material ready for piercing by obtaining the X and Y coordinate from blueprints or charts.

WIEDEMANN MACHINE COMPANY

4219 WISSAHICKON AVENUE • PHILADELPHIA 32, PA.

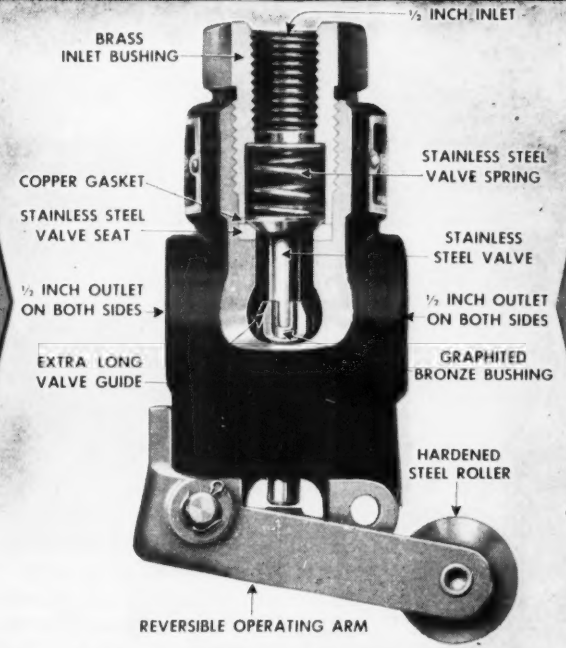
• Send today for the complete story of short run piercing economy . . . and then if you'd like to see a Wiedemann in operation, we'll tell you the shop nearest you that does short run piercing with a Wiedemann.



This Type R-7 Turret Punch Press cut production time from over 12 hours to 73 minutes on short run jobs. Get the proof!

INCREASE MACHINE TOOL EFFICIENCY with

Palmer-Shile AIR SAVER Leak Proof AIR VALVE



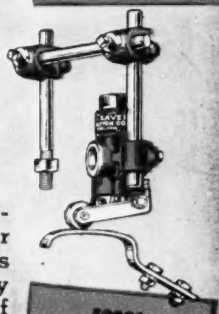
★ OPERATORS ★

Install AIR-SAVER AIR VALVES *on machines you now operate*

★ MANUFACTURERS ★

Build AIR-SAVER AIR VALVES *into your new machines for maximum efficiency*

A real precision-built, leak-proof air valve that completely harnesses air power and assures split-second air control at all times. The easy-to-install Air Saver mounts in any position—operates at any angle—unaffected by vibration—provides ample air volume for operation of single or multiple jets. A natural where air is used for cleaning, drying, cooling, positioning or ejecting. Especially recommended around punch presses, die casting machinery, drill presses—and in reaming, broaching and other operations. *Immediate Delivery.*



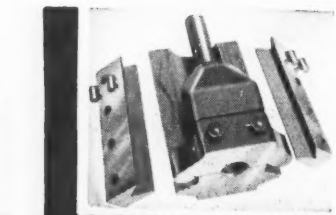
50801
Complete Assembly Includes Valve, Mounting Rods, Operating Cam.
$15.00

50975 (*Valve Alone*) $12.00

Palmer-Shile Co.

16022 FULLERTON AVE. • DETROIT 27, MICH.

Here is a PROFIT MAKING FEATURE



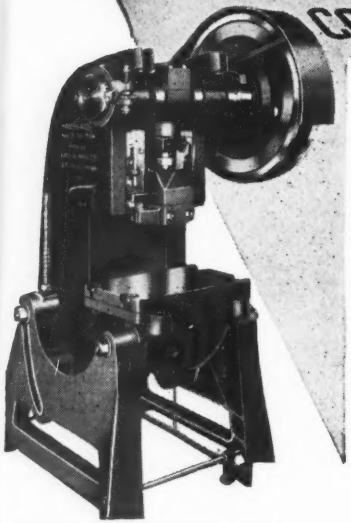
PRESS-RITE

PUNCH PRESSES

TRIPLE RAMWAY

LUBRICATION

CUTS PRODUCTION COSTS



6 MODELS
5 to 30 TON
CAPACITIES
BULLETIN P-348-M

WITH POSITIVE triple ramway lubrication you are assured of long period press operation.

The two constant feed cups on each gib, one for the front and one for the back, plus one cup for each "V" section of the slide provide continuous flow of oil to all sliding surfaces of the ramway, regardless of inclination of press. This positive lubrication eliminates unnecessary wear — reduces down time — increases accuracy, speed and efficiency all of which lowers cost per item produced. This means more profit to you.

Do what leading manufacturers are doing to cut production costs and step up profits. USE PRESS RITE PRESSES!

SEE THEM AT YOUR DEALER TODAY OR WRITE FOR BULLETIN P348-M

Sales Service Machine Tool Co.

PRESS RITE PRESSES

SHAPE RITE SHAPERS

KELLER POWER HACK SAWS

2363 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

2 COMPLETE LINES HELP SOLVE DIE DESIGN PROBLEMS

Why compromise when you can specify die springs that meet your individual requirements more exactly? Danly's two complete lines double your range of selection for any given application. Any standard size is available in either medium or heavy duty types.

All Danly Die Springs are precision coiled from the finest fatigue resistant steel and ground square on both ends to assure full end bearing.

Start selecting your die springs to fit the job . . . specify DANLY DIE SPRINGS!

Write today for our special size and price folder giving detailed information on Danly Die Springs and Danly Dowel Pins.

DANLY DOWEL PINS
Danly Precision Dowel Pins are hardened 58-60 Rockwell C to prevent upsetting in driving and are ground to tolerances of ± .0001" throughout. A complete range of .001" oversize pins is available for repair or renewal work.

DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

PRECISION DIE SETS . . . MECHANICAL PRESSES

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

NIAGARA

PRESENTS A COMPLETE *new* LINE OF ULTRA-MODERN FOOT SHEARS

with A SIZE TO FIT YOUR REQUIREMENTS

30 inch through 6 foot—16 gauge
8 and 10 foot—18 gauge

● Pick your foot shear from this complete new Niagara line. Check all their advanced and exclusive engineering features. Distinctive Styling. Easy, Lively Operation. Accurate Cutting. Clear Visibility of Cutting Line. Unbreakable Steel Construction. Strength and Stiffness. Light Weight. Lifetime Bronze Crosshead Ways and Treadle Bearings. Niagara Alloy Tool Steel Knives. Quick-Acting Back Gauge and Convenient Front and Side Gauges.

Write for data.

NIAGARA MACHINE & TOOL WORKS · BUFFALO 11, N. Y.
DISTRICT OFFICES: NEW YORK, CLEVELAND, DETROIT

for Amazing Performance and Extra Tool Life

ELECTROLIZING is a proven process which increases tool life by fortifying the cutting edges with surfaces so smooth that friction is reduced . . . and chip-weld virtually eliminated. Tools hold size longer.

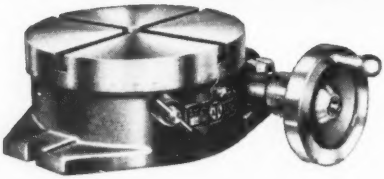
The MORSE ELECTROLIZING process obtains this extra tool life by two steps: (1) A treatment which raises the fatigue-point of the tool . . . and then, (2) A process, by which a new, hard . . . yet ductile alloy, .00003" to .00005" thick, is uniformly deposited on the cutting edges.

This proven ELECTROLIZING process . . . now a MORSE *exclusive* . . . means double . . . triple . . . or even greater tool life, for a slightly increased cost over that of regular MORSE Tools which can still be obtained. Specify MORSE ELECTROLIZED Taps, Dies, Drills, Reamers, Cutters and End Mills! Find out for yourself the amazing facts of ELECTROLIZED Performance, already proven to many large users of cutting tools. Your Morse-Franchised Distributor's salesman can help you with ALL your cutting tool requirements. Talk with him . . . for, now, more than ever, he's the top man to supply your cutting tool needs. Remember! YOU can *now* specify "MORSE ELECTROLIZED."

SOLD EXCLUSIVELY THROUGH MORSE-FRANCHISED DISTRIBUTORS

BRANCH WAREHOUSES: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

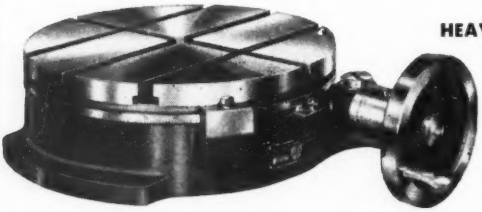
TROYKE ROTARY TABLES



STANDARD MODELS WORM WHEEL OPERATED ROTARY TABLES

Five sizes: 9", 12", 15", 18", 21".

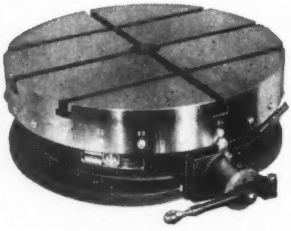
For Die Sinking, Jig Boring, Cam Milling. Indispensable in wood and metal pattern shops.



HEAVY DUTY MODELS WORM WHEEL OPERATED ROTARY TABLES

Three sizes: 18", 21", 25".

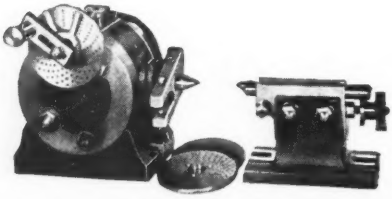
These larger, heavy duty models are used for Jig Work, Planer Jobs, and on Horizontal Boring Mills.



STATION INDEXING BALL BEARING ROTARY TABLES

Three sizes: 12", 15", 18".

These models are used for drilling and milling operations when quick and positive station indexing is required.



CARROLL DIVIDING HEADS

The illustration shows only one model of a complete line of Dividing Heads, and Spiral Driven Heads, consisting of twelve models, built in.

Three sizes: 6", 10", 12".

QUALITY PRODUCTS AT THE LOWEST PRICES

TROYKE MFG. CO., INC., CINCINNATI 9, O.

See your dealer or write us for complete catalogs.

PRODUCTION MARKING

helps you to lower today's high operating costs . . . .

Whatever you make Noblewest can mark permanently—faster—better—at lower cost. Typical is Noblewest Model 275 vertical dial Rapid Precision Marking Machine. Shown tooled for *marking and grooving* telephone wire splicing tubes, it does these two jobs in one operation at the rate of 125 pieces per minute. Simple gravity feed and unloading are both automatic and foolproof. The inscription is *permanently rolled in*—lasts as long as the product itself. Send for copy of our latest catalog "Modern Metal Marking Methods," or better still, let our engineers make recommendations for your specific requirements. Write Noble & Westbrook Mfg. Co., 25 Westbrook St., East Hartford 8, Conn.

Send for copy of our latest catalog "Modern Metal Marking Methods," or better still, send us complete details of your specific requirements.

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

Drive Down Tool Costs with . . . Apex Sockets and Wrenches

Here's how you cut tool costs when you use Apex sockets and wrenches: **FIRST.** They are accurately machined from electric furnace high carbon alloy bars—cold broached and carefully heat treated to give maximum strength and shock resistance. They are built to stand tremendous strains and shocks. **SECOND.** These sockets and wrenches can be furnished—on request—to definite hardness specifications for best service on specific jobs. **THIRD.** Apex sockets stay on the toughest jobs (self tapping screws, for example) much longer than ordinary sockets.

We're tooled up for speed and flexibility. Should you require a special wrench, send us sketch, blueprint or description and we'll quote promptly. Write for Catalog 18.

Female square drives:
1/4"—9/32"—3/8"—1/2"—5/8"—3/4"—1" and 1 1/2"

Catalogs will be sent only on requests written on company letterheads.

APEX sockets

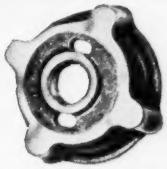
THE APEX MACHINE & TOOL CO., 1028 S. Patterson Blvd., Dayton 2, Ohio

Safety Friction Tapping Chucks; Quick Change and Positive Drive Drill Chucks; Vertical Float Tapping Chucks; Parallel Floating Tool Holders; Power Bits for Phillips, Slotted Head, Frearson and Clutch Head Screws; Hand Drivers for Phillips and Clutch Head Screws; Aircraft, Industrial Universal Joints; Sockets and Universal Joint Socket Wrenches.

How to bore, turn and face it faster?

Put it on a NEW BRITAIN

Precision Contour Turning and Boring Machine



Separate boring and facing operations on this automotive assembly were taking too much time. Looking for a way to get more pieces per hour, the manufacturer investigated every possibility and found a New Britain Model 37 to be the answer.

It first bores the I.D. of the shaft hole to ±.0005 tolerance and turns the O.D. of the shoulder to ±.0007 at a spindle speed of 680 R.P.M. To handle the interrupted cuts involved in the facing-chamfering operation, the spindle speed then automatically drops to 340 R.P.M.

Working on two pieces at a time, a production rate of 143 pieces an hour is accomplished. This not only meets production requirements, but substantially reduces cost per piece.

If your work involves any precision, contour or straight, boring and turning operations... look into these New Britain high production units.

If you would like to see other actual cost histories, write for the folder *"It Can Be Done."*

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

No Special Training Needed to Sharpen a Tap with the Blake Tap Grinder

Let us show you how quick and easy it is to use a Blake Tap Grinder

EDWARD Blake COMPANY

437 Cherry Street, West Newton 65, Mass.

Black Diamond Precision Drill Grinders . . . Blake Tap Grinders . . . Blake Flute Grinders . . . Waltham Cutter Sharpeners . . . Waltham Thread Milling Machines . . . American Tool Holders . . . Surface Finish Standards.

Here's the NEW *Bridgeport* I HP. MILLING ATTACHMENT

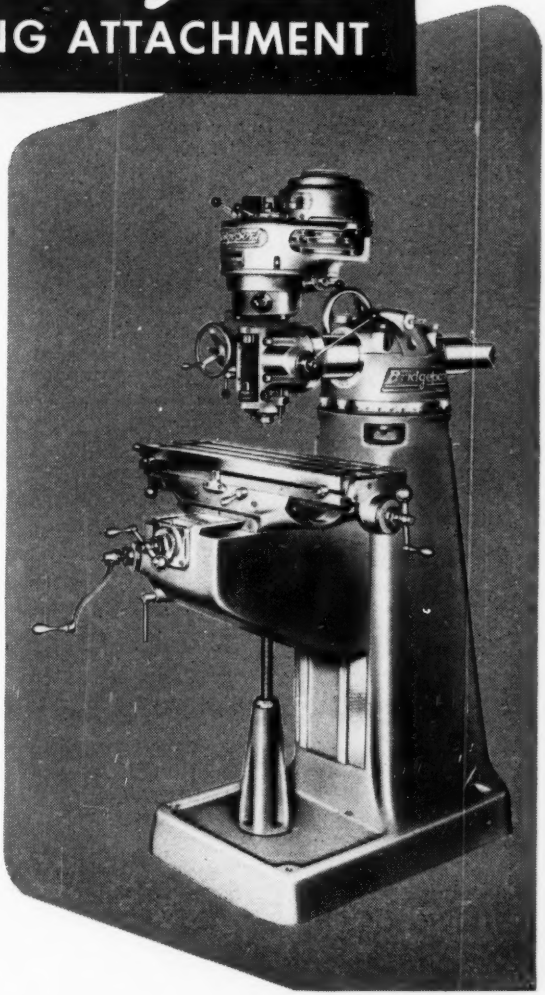
...a modern heavy-duty unit for today's needs of tool, die, mold and metal-working shops...

Among the many modern features are:

- ...eight spindle speeds from 80 to 2720 RPM.
- ...back geared spindle drive unit designed to utilize full horsepower at all speeds without belt slippage.
- ...5" quill travel.
- ...power feed to quill in three steps: .0015, .003 and .006 in. per spindle revolution.
- ...positive two-way power feed stop tripping mechanism.
- ...spindle brake and lock for convenient changing of tools.
- ...collet capacity up to ¾" diameter.

Equipment available for this new machine includes holders for shell mills, fly cutting heads, and the Bridgeport No. 2 Boring Head.

Complete details available on request.

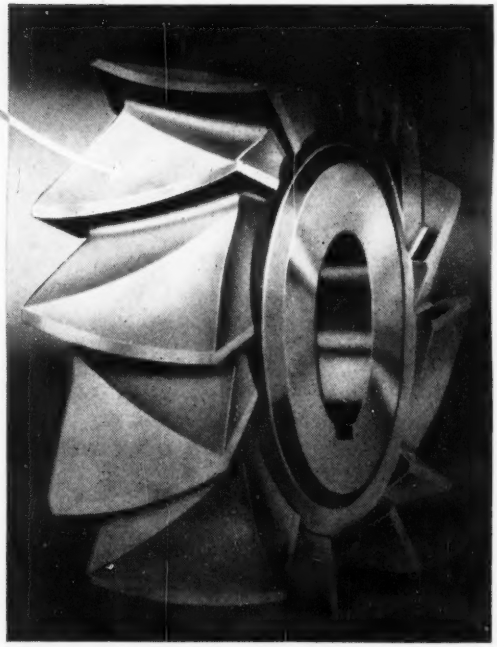


Bridgeport MACHINES, INC.

Bridgeport, Connecticut

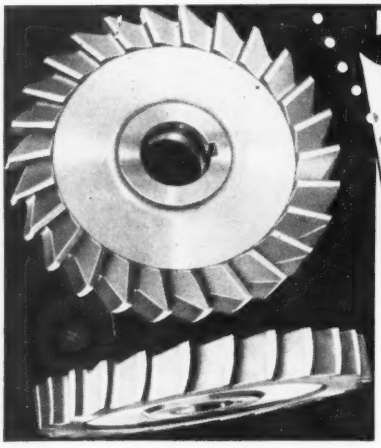
Manufacturers of High Speed Milling Attachments and Turret Milling Machines

150 *to* 425



YES . . . in a recent comparative performance test, 150 Aber "Curved Tooth" milling cutters *out-performed* 425 conventional type milling cutters — a 2½ to 1 increase at NO EXTRA COST!

Designed and developed specifically for production men who look to NEW tool designs to reduce top-heavy metal cutting costs, Aber "Curved Tooth" milling cutters operate at speeds 10% to 25% faster than standard straight tooth milling cutters in addition to providing smoother finishes and close to tolerance operations. Utilizing the most outstanding tooth design developed in the past decade, Aber Engineering Company produces a complete line of quality milling cutters featuring the "Curved Tooth" principle.



A TYPICAL ABER "CURVED TOOTH" PERFORMANCE

OPERATION: Milling lugs on plate. Slotting and side milling parallel sides.

MACHINE: Cincinnati 3-Spindle Mill.

TOOL SETUP: (1) R. H. and L. H. Shear Side Milling Cutter.
(1) R. H. Half Side Milling Cutter.
(1) L. H. Half Side Milling Cutter.
Feed: 10-1 2"

PERFORMANCE: 16-1 2 hours between grinds. Best previous practice with conventional, straight tooth H. S. S. milling cutters was 6-1 2 hours between grinds.

ABER

ENGINEERING WORKS INC.
WATERFORD, WISCONSIN

ONE MULT-AU-MATIC

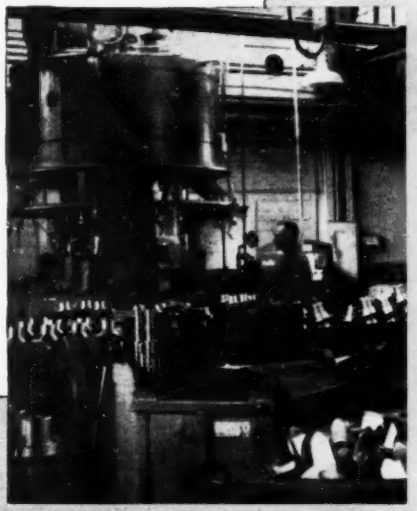
REPLACES

THREE

MACHINES

One Type "D" — 8 station Mult-Au-Matic now produces 26 pieces per hour floor to floor.

Best previous method — 3 machines, each producing 9 pieces per hour.



MANUFACTURING DATA

PIECE NAME

COMPANION FLANGE

MATERIAL...

Heat treated steel. Brinnel Hardness 269 — 229. (370/400mm impression diameter with 3000 kg load, 10mm ball)

REQUIRED TOLERANCES...

Diameters held within .005"
Flange to face and top of hub .0015"

OPERATIONS...

Load
Drill
Turn hub
Semi-finish — turn hub
Ream, Chamfer hub
Rough face top and finish flange
Finish hub to length
Finish taper ream
Finish turn hub

The customer expresses satisfaction with dependable performance and comments on the economies possible with Mult-Au-Matics.

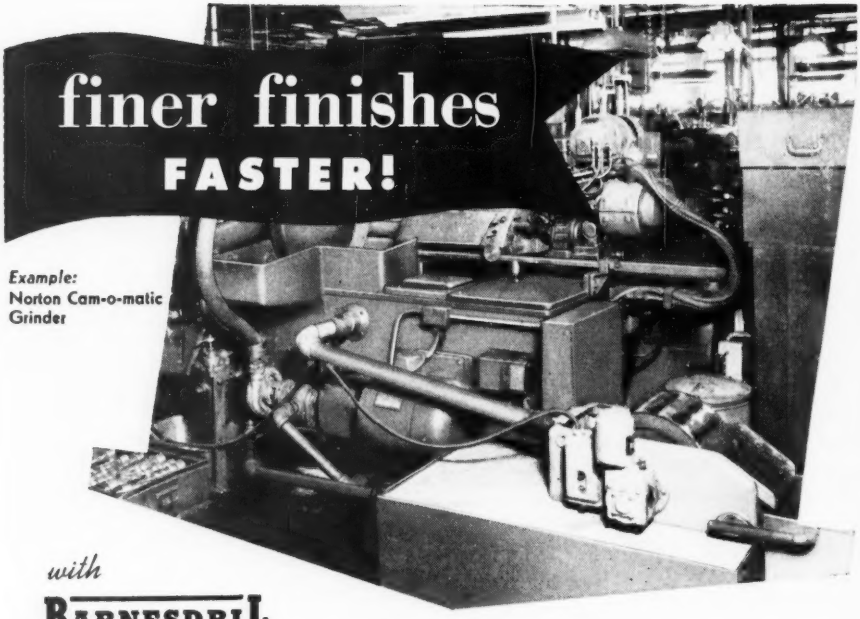
You too may benefit by investigating Mult-Au-Matics for your shop.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

Write for estimates on your work or call for a Bullard engineer.

finer finishes FASTER!



Example:
Norton Cam-o-matic Grinder

with

BARNESDRIL MAGNETIC COOLANT SEPARATORS

That's the report on almost every installation where BARNESDRIL Magnetic Coolant Separators are on the job removing fine grit and chips. Automatic removal by the separators of this sediment keeps the coolant supply consistently clean, and avoids surface scratches on the work which mar the quality of finish. Finishing is done faster because machines require less frequent shut-down for cleaning.

Production advantages such as these help greatly in reducing finishing costs. Why not investigate the possibilities for application to your grinding, honing, shaving or shaping work. A BARNESDRIL engineer will call on request and demonstrate these savings on coolant, maintenance and production costs.

Get a copy of this new catalog describing applications and capacities of all BARNESDRIL *Magnetic Coolant Separators. Ask for Bulletin B300E.*

BARNES DRILL CO.

860 CHESTNUT STREET ROCKFORD, ILLINOIS U.S.A.

HERE'S HELP FROM haskins

Improve Product Quality, Cut Production Costs!

Haskins Flexible Shaft Machines speedily and efficiently perform grinding, sanding, filing, wire brushing, buffing and polishing for die, mold, and patternmaking, stainless steel and general fabricating. And remember, with flexible shaft tools, the operator handles only the lightweight handpiece—the heavy motor is conveniently located 6 feet away. Operator works faster, with less fatigue. Haskins makes a complete line—for details, write R. G. Haskins Co., 2647 W. Harrison St., Chicago 2, Ill.

HASKINS

haskins

FLEXIBLE SHAFT EQUIPMENT

Haskins VB-2 develops up to 18,000 r.p.m. free speed. For general light production work.

Haskins HS-4 for general die shop work . . . ½ h.p., six speed countershaft develops up to 7800 r.p.m.

Haskins RA-5 for lacquer polishing, rubbing and sanding operations. Heavy-duty ½ h.p. direct drive speeds to 3425 r.p.m.

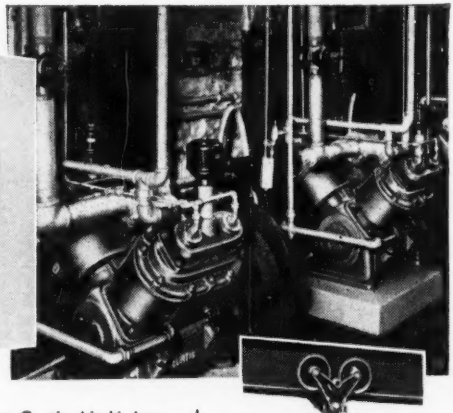
Haskins SPH-6 for stainless steel grinding, sanding, buffing, etc. 1 h.p. motor; four-speed countershaft; speeds to 3400 r.p.m.

Haskins HS-7 1 h.p. motor, four-speed countershaft develops up to 3100 r.p.m. For heavy grinding, sanding, wire brushing and polishing operations.

Reduce Production Costs

with CURTIS

AIR COMPRESSORS, AIR HOISTS AND AIR CYLINDERS



Plant after plant is turning to Curtis Air Hoists and Cylinders for pushing, pulling, lowering or lifting operations . . . and to multiple installations of Curtis Air Compressors, which eliminate long air lines, the possibility of air leaks, and losses resulting from breakdowns of central air compressor installations.

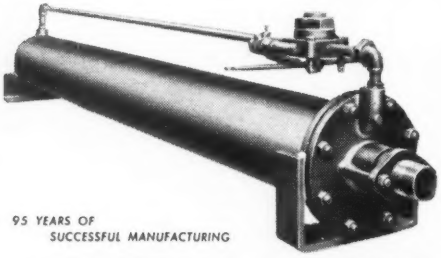
Here's why it will pay you to consider CURTIS *equipment*

AIR HOISTS AND AIR CYLINDERS

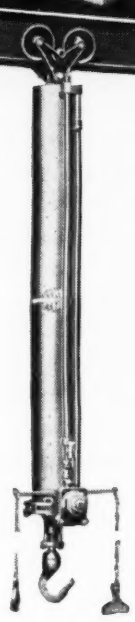
- Cannot be overloaded.
- Hoisting or lowering speed is controlled by operator.
- Ground-steel cylinder.
- Disc type valves.
- Valve automatically returns to vertical position when released.
- Can be operated by unskilled labor.

AIR COMPRESSORS

- Timken-bearing equipped — permits external adjustment.
- Self oiling — positive lubrication.
- Precision construction throughout.
- Complete valve assembly removed or replaced in a few moments.
- Cylinder, crankcase, also heads made from gas-tight iron.
- Fully enclosed.



Curtis bracketed-type Air-Hoist Cylinder can be placed in any position from horizontal to vertical.



Curtis Pendant Air Hoist can be used for practically any lifting problem where the head room is not limited.

95 YEARS OF SUCCESSFUL MANUFACTURING

CURTIS

95 Years of Successful Manufacturing

PNEUMATIC MACHINERY DIVISION

of Curtis Manufacturing Company

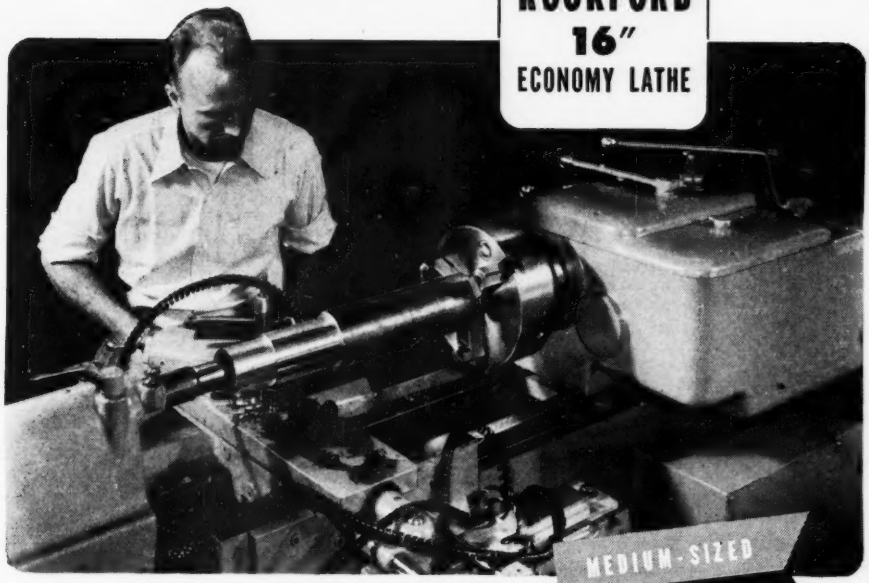
1913 Kienlen Avenue • Saint Louis 20, Missouri

149-4B

Turn COSTS *into* PROFITS

with

ROCKFORD 16″ ECONOMY LATHE

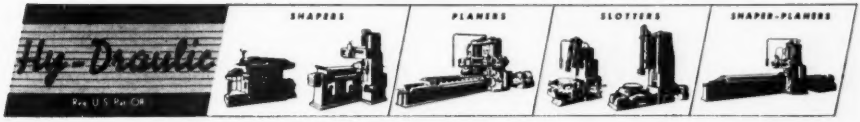


MEDIUM-SIZED

ECONOMY-PRICED

Larger Swing, More Power, Less Deflection, Heavier Cuts — Rockford 16″ and 18″ Economy Lathes incorporate these features in a *medium-sized* machine, with an *economy-price* range. Only years of experience gained in building these lathes have made it possible to provide such quality in this class. As you replace present lathes, consider these production and cost-reducing advantages of the new Rockford Economy Lathes. Your dealer will gladly supply you with full details today. Get a copy of our new Descriptive Bulletin No. E900-2.

ROCKFORD MACHINE TOOL CO. • ROCKFORD, ILLINOIS



The Right Combination

YOUR BLANCHARD
BLANCHARD WHEELS
BLANCHARD SERVICE

Blanchard Wheels for Blanchard Grinders are designed and manufactured under the same supervision which for one-third of a century has produced Blanchard Surface Grinders.

Those years of experience are available to help Blanchard users get the utmost in Service from their Blanchards.

Call upon us for advice, sample grinding, or personal call by our Service Department, or our local well-known Distributor.

Call Our Dealer

ATLANTA, GA.
Noland Company

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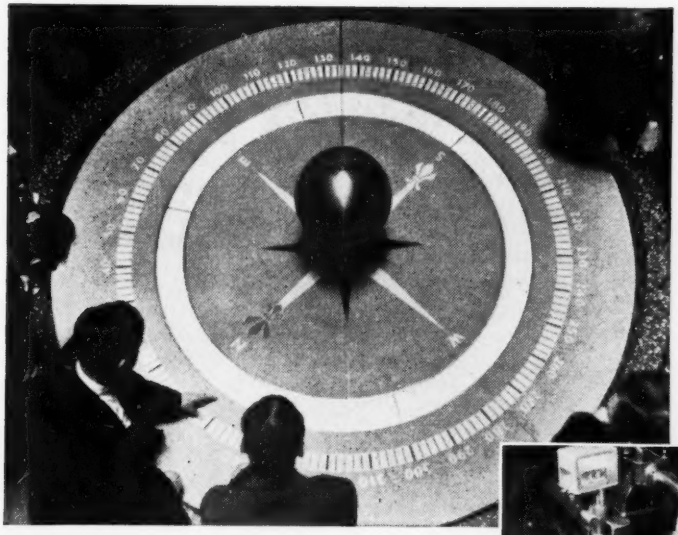
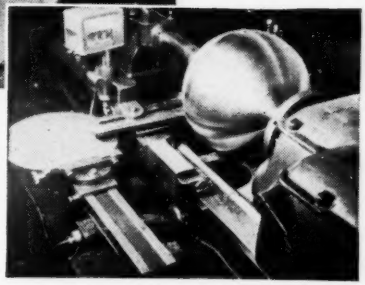
BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.



Foucault Pendulum, Chicago Museum of Science & Industry.



Turning perfect hollow sphere for Foucault Pendulum on Monarch Tracer-Controlled Lathe, circa 1935.

"WE DID IT THEN . . . WE CAN DO IT AGAIN"

with a Monarch Tracer-Controlled Lathe

More than fourteen years ago, the Chicago Museum of Science and Industry came to us with a machining problem no other lathe builder had been able to solve.

We solved it.

What they wanted was a perfect, hollow, bell-bronze sphere, machined to the exacting tolerances required in astronomical physics—for use as a Foucault Pendulum, to demonstrate the earth's rotation.

The important thing is not that we could bore and turn a perfect sphere, but it *is* important to you that intricate, accurate contours can be turned on a lathe—and that we've been doing it for fourteen years—and more.

We have the experience and the only *complete* range of sizes and types of tracing mechanisms being built today. Put this combination to work in your plant for "*peak production at a profit*".

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

FOR A GOOD TURN *FASTER* – TURN TO MONARCH

MAKES IT EASIER TO RADIALLY RELIEVE CUTTING TOOLS

★ **You, too, can take advantage of the faster, cleaner cutting ability and longer life of radially relieved tools.**

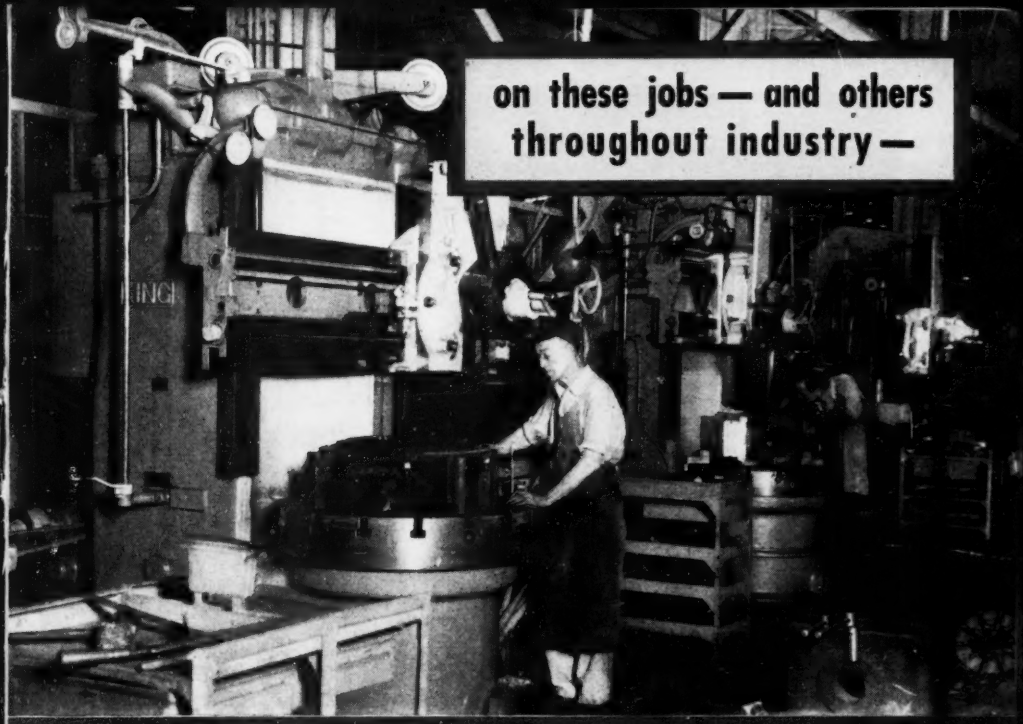
D-S has simplified the job. Any good grinder hand can produce this relief actually faster than regular angular back-off on taps, step drills, counterbores, profile mills, gear tooth rounding cutters, etc., of 1 to 14 flutes, with or without centers.

WRITE FOR OUR CATALOG ON TOOL GRINDING FIXTURES

D-S GRINDER DIVISION

ROYAL OAK TOOL & MACHINE CO.

621 E. 4th St. • Royal Oak, Mich.



KING VERTICAL BORING & TURNING MACHINES *Pay Profits!*

Here are two 42" King Vertical Boring and Turning Machines busy turning out a wide range of production in one of the major shops of a prominent railroad. In addition to the cylinder head and crosshead shown being turned and bored, other jobs that are put on these versatile King machines include piston and cylinder plate castings, bearings, hub liners, cylinder bushings, boxes of all kinds, packing rings, and many other locomotive parts.

Throughout industry, King Vertical Boring and Turning Machines are kept busy *all* the time, for they have the *built-in* ability to take on a wide variety of jobs, and turn out the work fast, accurately, and at reduced costs. Modern machine tools are a sound investment. Consult a King engineer on your boring and turning requirements. It costs you nothing—and it can help you pave the way for substantial savings in easier, faster, and better production.

10 sizes — 30" to 144" swing — all available with or without side head. Write for complete specifications on the size machines that meet your work requirements.

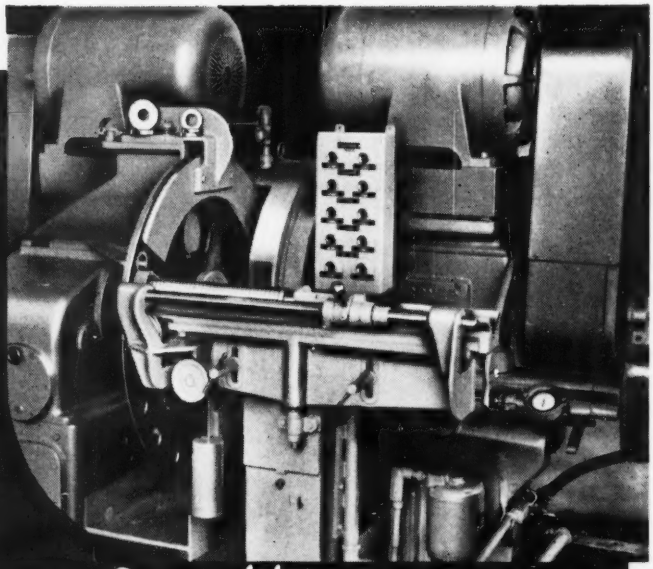
American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

Improve the CUT —and CUT the COSTS— with GARDNER *Double* GRINDERS!



As competition becomes keener, quality and costs become increasingly important. With many types of parallel-surfacing operations, GARDNER *Double* GRINDING both *improves* the accuracy of the *cut*, and *cuts* the *cost* of production.

WORK DATA

Part: Gear Blanks
Material: Steel
Operation: Grind Two Sides
Tolerances: .001" for Parallelism and Uniformity
Stock Removal: .015" Maximum (Roughing Cut); .001" to .002" Maximum (Finishing Cut)
Production: 18 to 20 Pieces Per Minute, Per Cut
Feed: Hand Load to Trough-type Feed Attachment; Automatic Unload
Machine: #125-26" Gardner Double Grinder

As in the example shown above, specially adapted, semi-automatic fixtures keep the parts moving between two opposed grinding wheels, where TWO sides are ground with ONE pass through the machine.

Use Modern GARDNER WIRE-LOKT Abrasives on YOUR Disc Grinders!

***SPEND* Money to *SAVE* Money!**

You can help make more sales — and more profits — by investing in quality-improving, cost-cutting GARDNER *Double* GRINDERS.

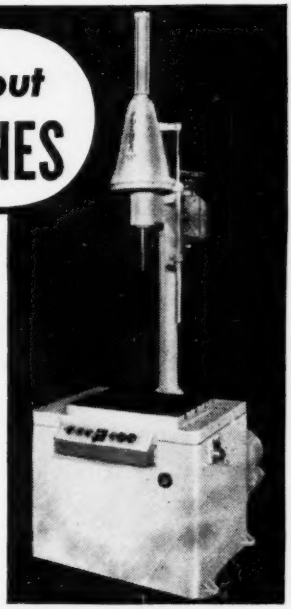
GARDNER - GRIND YOUR *Flat* SURFACES

Write for Latest Bulletin on Gardner DOUBLE Grinding!

GARDNER MACHINE COMPANY

428 East Gardner Street • • • • Beloit, Wisconsin, U.S.A.

You should know MORE about
FULMER HONING MACHINES

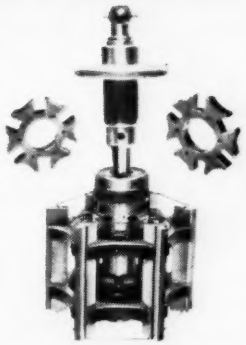


Fulmer Model 412
½"-4" honing capacity

. . . to get high speed accuracy on finishing all types of cylindrical bores from ½" to 30" diam. Fulmer Honing Machines remove stock **faster,** more **economically,** with **greater** accuracy, than **any other method.** Rugged in construction, simple to **operate,** Fulmer Honing Machines give maximum production with minimum investment.

★ **WRITE FOR NEW HONING BULLETIN, fully illustrated.** Gives valuable information on honing applications, **Alexander Ball** tools, and specification details on all models of Fulmer Honing Machines.

HONING TOOLS NOW AVAILABLE!



The Alexander Ball line of honing tools is now distributed exclusively in the United States by C. Allen Fulmer Co. Available in sizes from ½" to 50" diam. In many sizes of these tools, removable flanges are available in 1" or 3" increments of diameter. The same stone holders and basic tool are used. With **Alexander Ball** Tools the investment is very low where a wide range of diameters are honed. Write for complete details and prices.

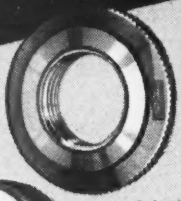
C. ALLEN FULMER CO.
1233 First National Bank Bldg.
CINCINNATI 2, OHIO

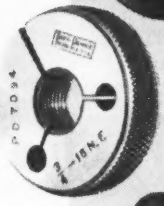
For More Measurements Per Gage Dollar

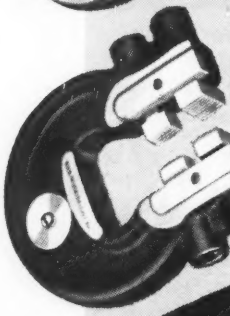
Style 9416—Thread Plug Gage
TAFT-PEIRCE MFG. CO.
Style 9410-R—Reversible Thread Plug Gage, Go and Not-Go
Style 9410—Taper Lock Thread Plug Gage, Go and Not-Go
Style 9474—Pipe Plug Gage

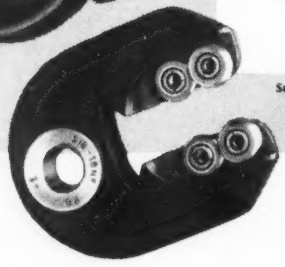
...specify

TAFT-PEIRCE Thread Gages









These Taft-Peirce thread gages are built to give you longer gage life. Made of the finest materials, this complete line is produced with the accumulated skill of one of the world's most experienced manufacturers of gages. Delivery of standard sizes can be made immediately from stock; prompt shipment can be expected on made-to-order specials.

For quotations, price lists, literature, 'phone your nearest Taft-Peirce representative or write—

The TAFT-PEIRCE Manufacturing Company
WOONSOCKET, R. I.

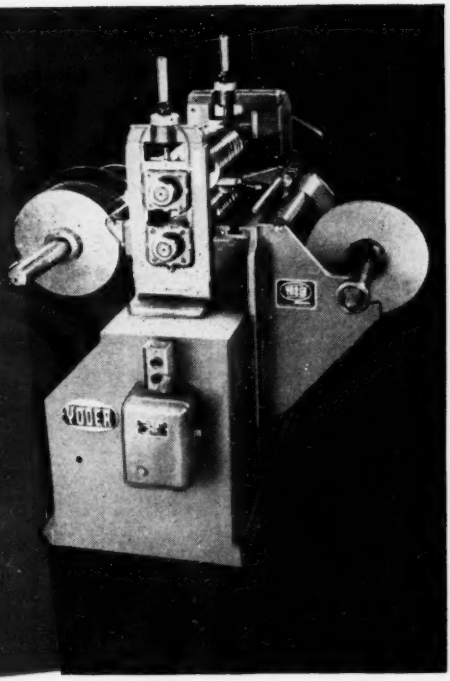
T-P means TOP PRECISION

Announcing

a small new

COIL SLITTER

complete with Coil Holder and Recoiler for Coils up to 250 lbs. 18" wide. Stock from .003" to .062" thick



Precision-built for Highest Slitting Accuracy

This new Yoder No. L-18 is easily the finest small slitter ever built, complete with Coil Holder and Recoiler. It embodies the same sturdy, high class, basic features as the larger standardized Yoder slitters, including adjustable anti-friction bearings, micrometer-controlled arbor adjustment, toggle gearing permitting arbor adjustments up to 2" while maintaining full gear mesh, etc.

Its speed, 150 f.p.m., easy, accurate controls and adjustments, make it the slitter par excellence for high production in slitting thin ferrous and non-ferrous stock to the closest tolerances.

Being assembled largely from parts already standardized in Yoder Cold Roll Forming Machines, it can be offered at a price which makes it a real buy for small and large shops needing a high class small slitter.

Complete information on request.

THE YODER COMPANY
5532 Walworth Avenue • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING

ROLL FORMING, TUBE MILL AND SLITTING MACHINERY

41 YEARS' LEADERSHIP • COILING • SLITTING • FORMING • EMBOSSING • CURVING • WELDING • CUTTING-OFF

Substitute 1 Machine for 3 or 4!

RAISE PRODUCTION and LOWER COSTS

BY COMBINING OPERATIONS with the MOTCH & MERRYWEATHER

"DE" (Double End) TRANSFER MACHINE

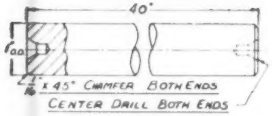
1 SAWS STOCK TO ACCURATE LENGTHS

2 (1) Chamfers both ends. (2) Center drills both ends. (3) Center drills and chamfers both ends. (4) Threads both ends (to a reasonable length). (5) Trepans one or both ends. (6) Turns one or both ends (box tool). (7) Chamfers O.D. and I.D. of tubing. (8) Reams one end or both ends of tubing. (9) Chamfers O.D. and reams both ends of tubing.

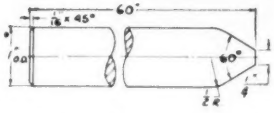
MORE THAN A NEW MACHINE—ACTUALLY A NEW METHOD

• The Motch & Merryweather "DE" (double end) Transfer Machine has no equivalent. Standard bar stock is automatically fed, cut off with a square *milled finish* to accurate lengths of ±.004"; then automatically transferred to equalizing, self-centering jaws for accurate double-end machining. You save at least one operator; save several handlings; save overhead and floor space; save tooling Husky construction makes for trouble-free service and long, profitable life.

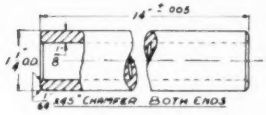
Illustrated below are six typical "transfer" jobs.



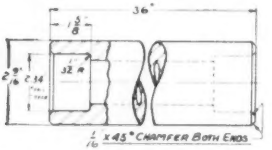
Operation: Cut off, chamfer and center drill both ends.
Material: SAE 1040 ground shafting.
Production: 240 pcs/hr



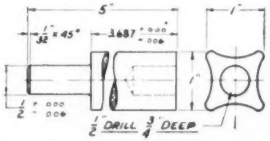
Operation: Cut off, chamfer one end, point opposite end.
Material: D SAE 1141 C. R.
Production 163 pcs/hr



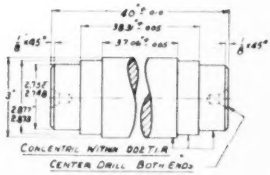
Operation Cut off and chamfer both ends
Material 1020 seamless tubing
Production 342 pcs/hr



Operation: Cut off, bore and chamfer inside and outside, both ends.
Material: SAE 1020 tubing.
Production: 180 pcs/hr.



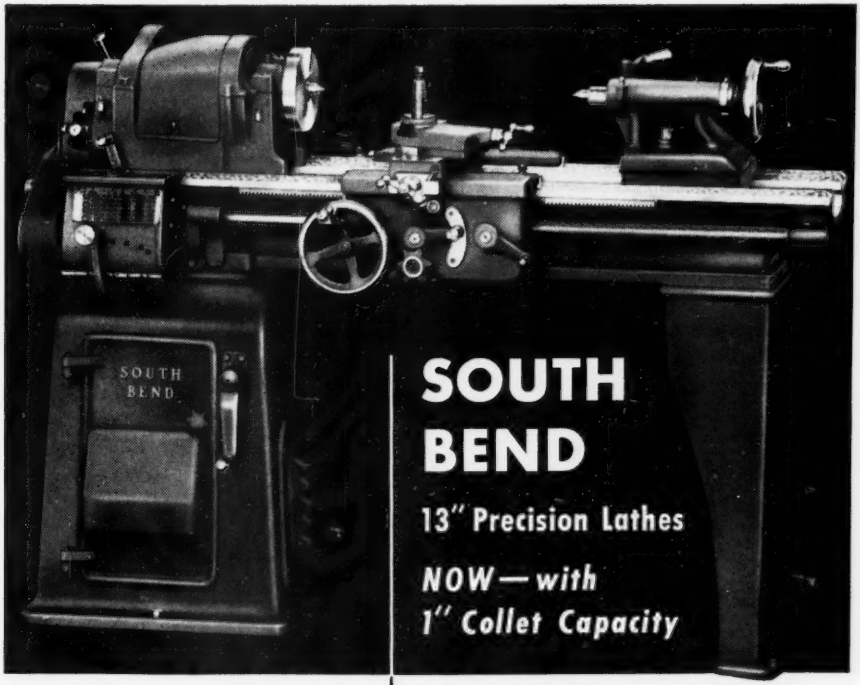
Operation: Cut off, turn one end, drill opposite end
Material Extruded brass
Production: 200 pcs/hr



Operation Cut off, box mill, turn and center drill both ends.
Material SAE 1020
Production 140 pcs/hr

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING • CLEVELAND 13, OHIO

AT YOUR COMMAND • AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWING



SOUTH BEND

13" Precision Lathes

NOW — with 1" Collet Capacity

Catalog No. 145-B 13" x 5' Quick Change Gear Lathe – 3 ph., 60 cy., 220 V., A.C. motor, drum switch; f.o.b. factory $1332.25

South Bend 13" Precision Lathes with this extra collet capacity offer even more advantages for close-tolerance machining. They are economical of power, accurate, fast and versatile. Substantial savings in capital investment, floor space and labor cost often result from their installation.

The Quick Change Gear model is popular for production, maintenance, and service operations. The Toolroom model has sufficient capacity and ample accuracy for a large variety of toolroom work. South Bend also makes 9", 10", 14½", 16", and 16/24" swing Precision Lathes; ½" and 1" collet Precision Turret Lathes; 14" Drill Presses; and a 7" Bench Shaper. Time Payment Plan is available.

SPECIFICATIONS

SWINGS: 13-1/8" over bed and saddle wings; 8-3/4" over saddle with chip guard removed.

BED LENGTHS . . . . . 4, 5, 6, and 7 feet

DISTANCE BETWEEN CENTERS . . 16 to 52 inches

MAXIMUM COLLET CAPACITY: 1" (Collets interchangeable with South Bend 10"-1" Collet, Series 1000, 14-1/2", 16", and 16/24" Lathes)

SPINDLE BORE . . . . . 1-3/8 inch

SPINDLE SPEEDS: Eight . . . . 34 to 875 r.p.m.

POWER LONGITUDINAL FEEDS: 48 . . .0015" to .0841"

POWER CROSS FEEDS: 48 . . .0006" to .0312"

THREAD CUTTING: 48 R. or L. pitches, 4 to 224 per in.

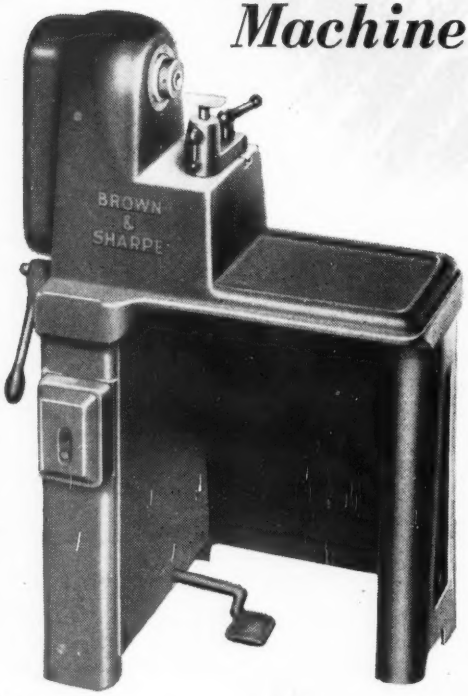
***Write* FOR THIS CATALOG NO. 73**

Describes and illustrates new South Bend 13" Precision Lathes with 1" maximum collet capacity. Complete specifications and prices are included.

SOUTH BEND LATHE WORKS

Building Better Tools Since 1906 • 427 E. MADISON ST., SOUTH BEND 22, IND.

NEW Polishing and Finishing Machine



CAPACITY . . . spindle takes collets for up to 1" diameter stock. Swing over bed 9¾" diameter; over rest, 7¾" diameter.

BROWN &

Here's 3-way improvement for your screw machine department

- *Faster Burring*
- *Faster Polishing*
- *Faster Filing*

THIS NEW ADDITION to the Brown & Sharpe line has 3 special features that make it extremely advantageous for general, all-around polishing and finishing of small parts.

1. A compact, completely self-contained design . . . permits operator to work fast and easily when sitting or standing. Foot pedal control of collet and brake leaves operator's hands free to load, perform necessary operations and remove work.
2. Three spindle speeds . . . up to 4500 r.p.m. . . . suitable for wide range of materials and operations.
3. Only the spindle is started and stopped for inserting and removing work—reducing inertia, wear and motor heating. Constant speed motor runs continuously with V-belt drive released by foot pedal.

Get complete information on these and other efficiency-boosting advantages. Write for new Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

SHARPE B·S

Interchangeable Pilots
Radial Drive Counterbore
Pin Drive Counterbore
STANDARD ECLIPSE TOOLS
Eclipse at all times stocks 1,000 Standard items (in 100,000 quantity) for immediate delivery to you. Let Eclipse carry your inventory of fine cutting tools!
Balanced Drive Inverted Spotfacer
Self-Centering Countersink
Two Piece Core Drill
Interchangeable Counterbore Set
Pilated Countersink

ECLIPSE COUNTERBORE CO.

Founded thirty five years ago

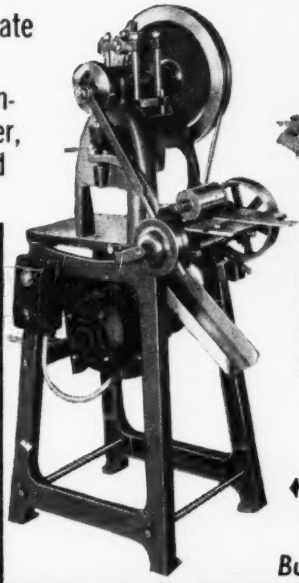
DETROIT 20, MICHIGAN

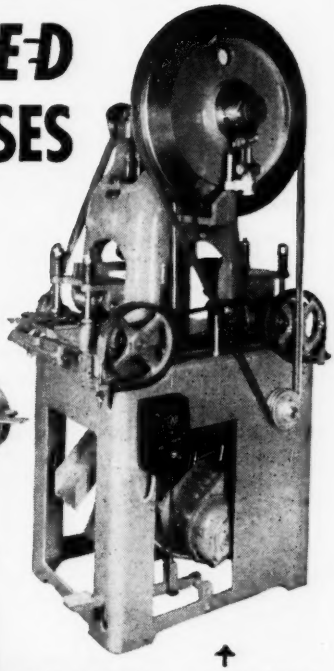
Speed and Efficiency Equal - MORE PRODUCTION ! - MORE PROFIT !! - LOW COST !!!

WITH PRECISION BUILT

DIEBEL HI-SPEED AUTOMATIC PRESSES

- Economical to Operate
- Low Initial Cost
- For Ferrous and Non-Ferrous Metals, Fiber, Plastics, Rubber and Paper.





← 5 TON PRESS 180-550 STROKES PER MINUTE

12 TON PRESS 65-300 STROKES PER MINUTE →

Built-in Automatic Feed

COMPLETE INFORMATION

Mailed on Request

Production Facts, Photographs of Compound and Progressive Dies, Capacities, Ranges, Sizes, Dimensions, Full Specifications.

DI MACHINE CORP.

2714 IRVING PARK ROAD, CHICAGO 18, ILL.

with the

CIRCULARITY-GRINDING ATTACHMENT

✓ Check THESE USES FOR YOUR SHOP . . .

- GRIND RADIAL RELIEF
- GRIND FORM RELIEF
- GRIND RADIAL AND FORM RELIEF AT ONCE
- GRIND OUT FLUTES
- GRIND ALL TYPES OF CIRCULAR FORM TOOLS WITH SPIRAL FORM . . . life-time relief
- GRIND RELIEF ON O.D. AND FACE OF STEP TOOLS AT SAME TIME *WITH .005" MAX. RADIUS IN CORNER*

Also used as motor-driven headstock for grinding straight or tapered cylindrical work

Grinds any length FLUTE STRAIGHT or TAPERED

The Circularity-Grinding Attachment accurately and easily produces form, radial or form and radial relief together on both straight and *spiral fluted* tools . . . *on any lead or spiral.* The amount of relief and spiral is quickly set up by scales on the attachment and relief produced is identical on every tool ground from the same set-up.

There are no special fixtures required for any tool and work may be held between centers or in a chuck. The attachment is easily adapted to any type of cylindrical or cutter grinder and can serve as a motor-driven headstock for cylindrical grinding when not grinding relief.

SEND FOR BULLETIN WHICH GIVES COMPLETE DETAILS

D R & T COMPANY

DETROIT REAMER & TOOL CO.

Mfrs. of Special High Speed Cutting Tools

2830 East 7 Mile Rd. Detroit 12, Michigan

Fourth in a series of
Unusual Grinding
Wheel Operations

KEEN EDGE MACHETES ARE A JUNGLE "MUST"

● This machete, known by the natives of Central America as the "Collins Knife", is used for slashing through jungles, on sugar and coffee plantations . . . and for self protection. It is sharpened to a razor-finish and is standard "dress" equipment for nearly all natives.

Whatever YOUR grinding problem may be, BAY STATE can solve it . . . fast. Possibly the exact specifications to meet your requirements can be supplied directly from large stocks either in Westboro, branch warehouses, or from our distributors strategically located throughout the United States.

Send us your grinding problems. We can help you.

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Mass., U. S. A.

Branch Offices and Warehouses —
Chicago, Cleveland, Detroit
Distributors — All Principal Cities

BAY STATE®

MEMBER OF THE
GRINDING WHEEL INSTITUTE

Top Performance Consistently Duplicated

TRAP DUST DEVILS

WITH A *Hammond* DUSKOLECTOR

Dust control is today a necessity, in every shop or plant. Modern production managers and other experts agree that *dust laden air* (1) Impairs employee health (2) Reduces employee efficiency (3) Ruins valuable machinery.

Dust laden air in your factory is a costly menace . . . consuming many unseen dollars yearly. Hammond DUSKOLECTORS will solve your grinding dust problem. Recommended for tool grinding, general grinding and for polishing operations using dry abrasive wheels.

THREE SIZES:

¼ H.P., ½ H.P., 1 H.P. We also manufacture Cyclone type dust arresters in ½ H.P., 1 H.P. and 1½ H.P. capacities.

WRITE FOR FOLDER AND COMPLETE INFORMATION

Hammond Machinery Builders INC.

1615 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN, U.S.A.

HOW Can You Test the Hardness of

. . . a .003″ diameter wire?

. . . parts weighing hundreds of pounds?

. . . sheets only .001″ thick?

. . . internal surfaces of cylinders?

. . . individual constituents of alloys?

. . . gear teeth on the pitch line?

THESE are simple, every-day jobs for Wilson hardness testing equipment. Any of our representatives can give you the answer to these and many other such questions.

Write us about any problem you have involving hardness testing. Our factory-trained engineers will be glad to work with you.

See Us at Space Number 925 at the Metal Show

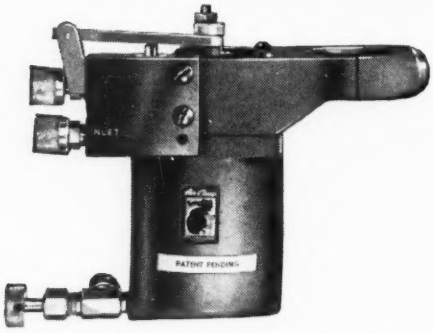
WILSON ACCO

MECHANICAL INSTRUMENT CO., INC.

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

230-G PARK AVENUE, NEW YORK 17, N. Y.

DOUBLE YOUR DRILL PRESS OUTPUT FOR $30



USE A NEW MEAD PNEUMATIC DRILL

This simple, inexpensive device quickly converts standard drill presses into semi-automatic machines — increases production substantially on suitable jobs: double or more in some cases.

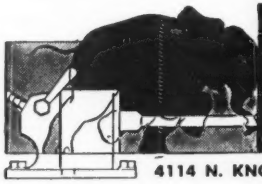
Clamps to spindle quill in a few seconds. Automatically closes air fixture on work. Adjustable feed control and break-through cushion. Quick return. Easy to synchronize with automatic cycle equipment.

Air-Power does it quicker, cleaner, better. Write today for latest complete catalog.

PRESS FEED

for

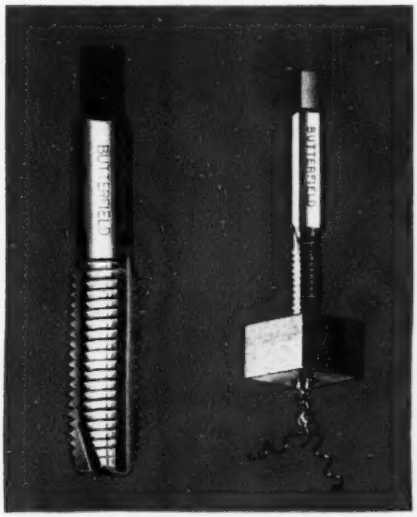
DRILLING
REAMING
TAPPING



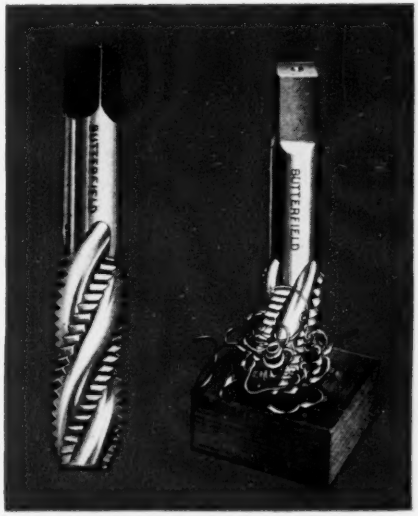
MEAD
SPECIALTIES COMPANY

4114 N. KNOX AVE., DEPT. AA-109, CHICAGO 41, ILL.

Let the chips fall either way!



CHIPS CURL DOWN and out of deep through holes when you use Butterfield Ground Thread Spiral Pointed Taps — right hand cut, left hand spiral points. No chip clogging in the flutes. These taps also recommended for blind holes when drilled deeply enough to allow clearance for chips at bottom of hole.



CHIPS SPIRAL UP and out of blind holes that have little or no chip room at the bottom when you use Butterfield Ground Thread Spiral Fluted Taps — right hand cut, right hand spiral flutes. Flutes are milled to the correct degree of spiral allowing tap to cut freely while ejecting chips from hole.

INSIST ON BUTTERFIELD GROUND THREAD TAPS

Whether you want to tap blind holes or through holes, there's a Butterfield Tap to meet your need . . . to cut smooth, accurate threads in aluminum, magnesium, brass, copper, zinc and similar materials. What's more, because they're *Butterfield*, you get extra assurance of top performance, maximum savings in time and money. *Every Butterfield Tap is individually inspected.* These taps, too, are *ground thread* . . . providing maximum accuracy and savings by fewer wasted threaded parts.

For quick deliveries, depend on your nearby Butterfield Distributor. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec.

BUTTERFIELD

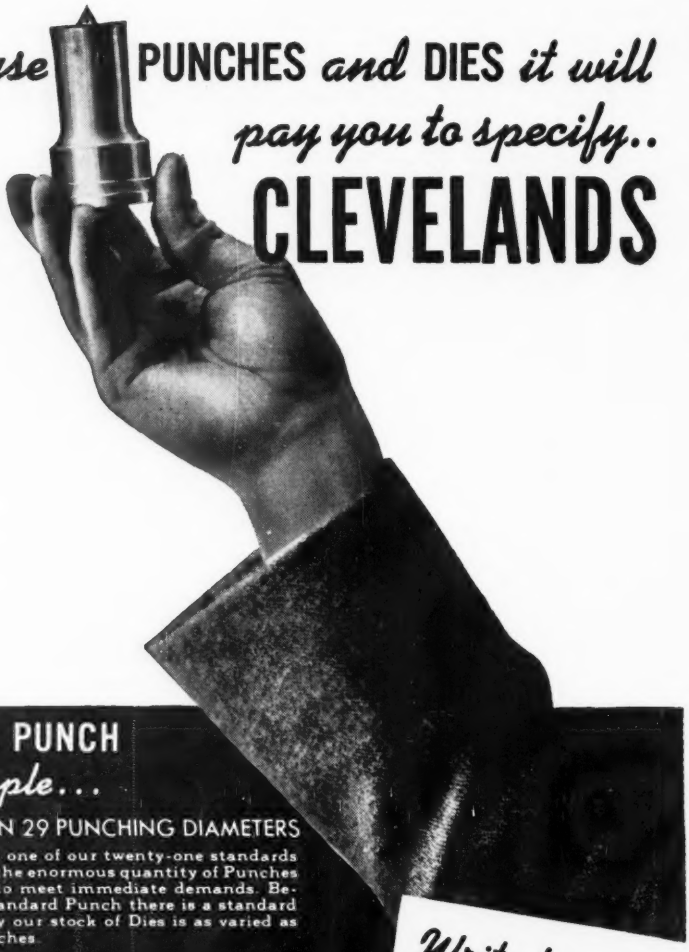
THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES

If you use PUNCHES *and* DIES *it will pay you to specify..*

CLEVELANDS



Take this PUNCH *for example...*

WE STOCK IT IN 29 PUNCHING DIAMETERS

and as this is but one of our twenty-one standards you can imagine the enormous quantity of Punches carried in stock to meet immediate demands. Besides, for each standard Punch there is a standard Die, consequently our stock of Dies is as varied as our stock of Punches.

WE MAKE PUNCHES AND DIES FOR ALL THE SHAPES SHOWN

Write for SMALL TOOL HAND BOOK

THE CLEVELAND PUNCH & SHEAR WORKS CO. U.S.A.

Established 1880

PUNCHING TOOLS & DIES

FABRICATING TOOLS

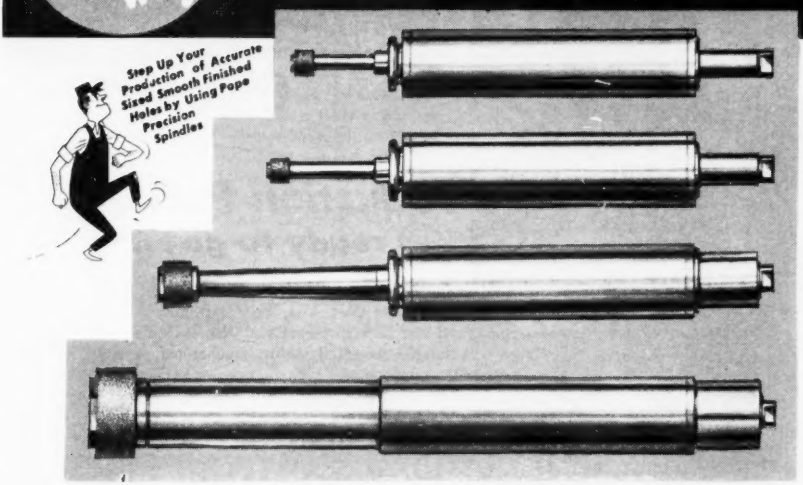
POWER PRESSES

OFFICES AT
NEW YORK ... CHICAGO
DETROIT ... PHILADELPHIA
PITTSBURGH

CLEVELAND 14, OHIO

7 sound reasons why

POPE PRECISION INTERNAL GRINDING SPINDLES WITH THE POPE SEALED-IN LUBRICATION SYSTEM ARE THE RIGHT SPINDLES FOR YOUR GRINDERS



1. Increased Production. Pope Spindles speed up output because they can take heavy cuts.

2. Better Finished Ground Holes. The precision craftsmanship used in the manufacture of Pope Spindles assures work of the highest standard.

3. Increased Wheel Life because the shaft is rigidly supported by bearings of ample size, properly preloaded to withstand both radial and axial loads.

4. Super Precision Bearings made to Pope specifications are used exclusively in Pope Spindles. These bearings are all international standard sizes.

5. Operating Time Saved by eliminating frequent change of motor pulleys. Pope Internal Grinding Spindles are designed to be driven from the same motor pulley except in rare and special applications.

6. No Lubrication is required during the life of the bearings. Time is saved and production is increased by not having to add oil or grease to the bearings periodically. With the Pope Sealed-In Lubrication System, all foreign matter is sealed out at the same time lubrication is sealed in.

7. Dynamic Balance. Pope Spindles are dynamically balanced with all their rotating parts in full assembly.

Pope Precision Internal Grinding Spindles come in the sizes, shaft extensions and speeds (up to 35,000 RPM) to meet your every need. Ask for new catalog No. 57.

No. 63

POPE

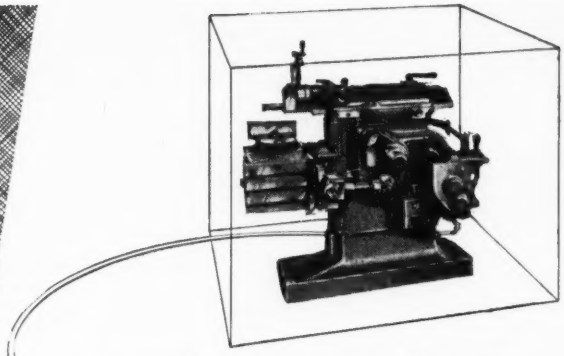
TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES



Production Package ready to go . . .

Buy a Hendey 12" Universal Crank Shaper – plug it in – it's ready to go – without further purchases, because standard equipment *includes* table and vise for positioning and indexing work to any angle. You also get flanged mounted motor, mechanical controls on both sides, automatic lubrication, quick-change swivel head, adjustable, preloaded Timken bearings on the crank gear, plus many other features usually considered "extra".

The Hendey 12" Crank Shaper is finished like a fine watch, both inside and out. Here is an accurate, fast money-maker for tool room and production work. Write today for complete details.

BRIEF SPECIFICATIONS

Length of Stroke	12¾"
Strokes per minute	14 to 200
Speed changes	8
Vertical travel of tool slide	4⅝"
Table top tilts either way	15°
Max. distance vise to ram	8 3/16"
Max. rotation of table	360°
Max. vise opening	10½"
Net weight	2825 lbs.
Floor space	46" x 68"

Other Hendey Machines Include
Tool Room Lathes — 9"- 12"- 14"- 16"- 18"- 20"- 24"
Shapers — 12"- 16"- 20"

THE *hendey* MACHINE COMPANY

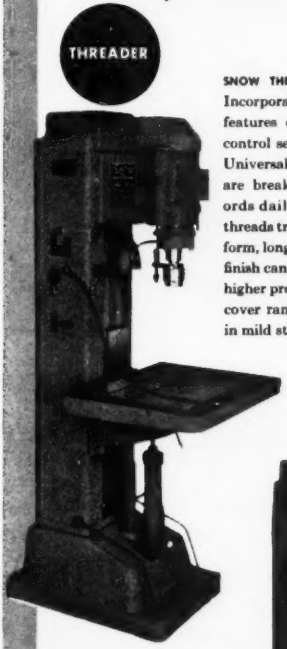
MAIN OFFICE & PLANT: TORRINGTON, CONN.

BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

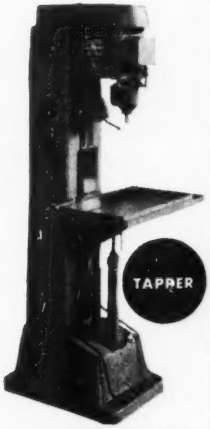
REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

hendey

Unprecedented PRODUCTION PEAKS



SNOW THREADING MACHINE — Incorporating all the advanced features of air and electrical control sensitivity, Snow Full Universal Threading machines are breaking production records daily. Highly accurate threads true to lead and thread form, long chaser life and clean finish can be obtained at much higher production rates. 2 sizes cover range from #3 to 1 inch in mild steel.



SNOW FULL UNIVERSAL TAPPING MACHINE—4 sizes cover range from #0 to ¾ inch in mild steel.

SNOW FULL UNIVERSAL DRILLING MACHINE—2 sizes range from #60 to ⅞ inch in mild steel.

SNOW

FULL UNIVERSAL

DRILLING, TAPPING & THREADING MACHINES

Air-operated, Electrically Controlled

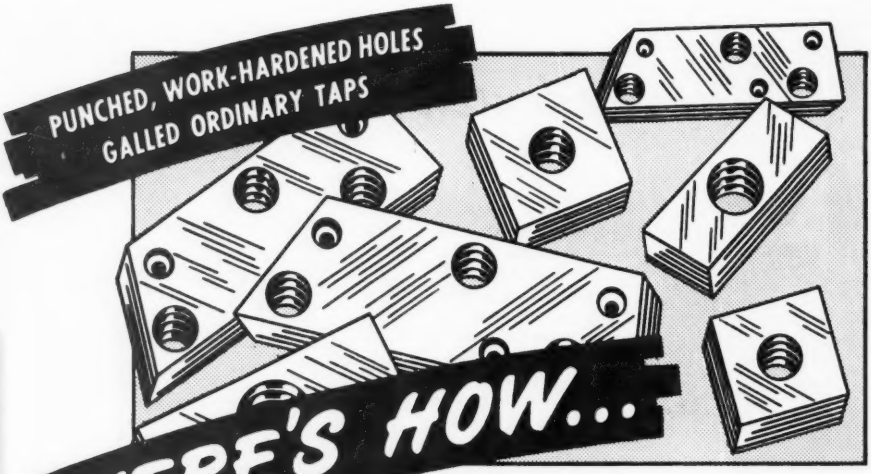
In tomorrow's rugged profit competition only the best designed, highest producing machine tools can win. Snow machines, minimizing operator skill and effort are cutting costs of small parts in thousands of plants. They provide every conceivable method of control and permit quick set-up with any type of hand feed or automatic holding fixture. Extremely sensitive in feed, and accurate in depth of stroke. Production records previously unheard of are being reported.

Snow

HIGH PRODUCTION DRILLING TAPPING THREADING, NUT TAPPING, 2 SPINDLE, HORIZONTAL MACHINES, DRILL PRESS TAP HEADS, JIGS AND FIXTURES

SNOW MANUFACTURING COMPANY
441 EASTERN AVE., BELLWOOD, ILLINOIS
(Chicago Suburb)

Submit sample parts and blue prints for quotation, production estimates and tooling data.



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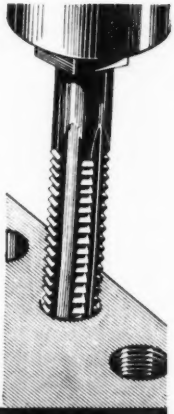

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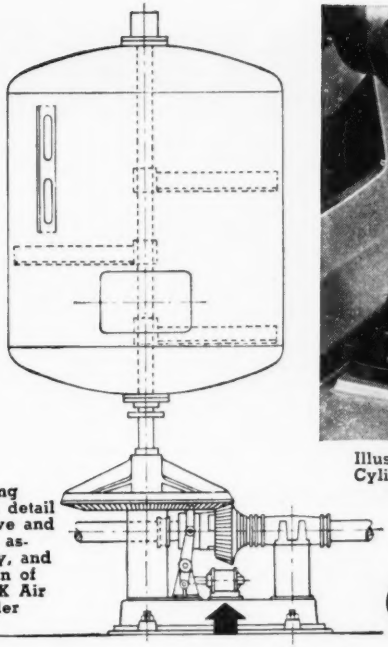

Drawing shows detail of drive and clutch assembly, and location of NOPAK Air Cylinder

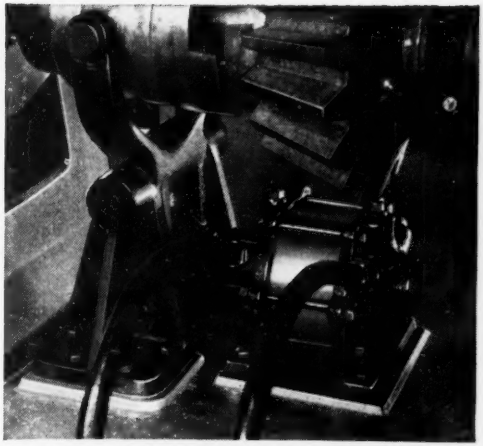

Illustration shows NOPAK Model "A" 6" Cylinder which throws clutch in and out

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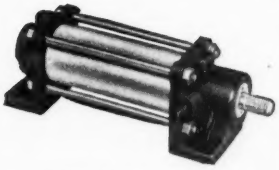

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OCTOBER, 1949 Vol. 22, No. 5

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1899 Model A Packard and 1949 Golden Anniversary Packard Super

Heat Treating Parts at Packard

Efficient equipment enables Packard Motor Car Company to maintain high production of heat treated parts.

By Fred W. Vogel

AGAINST a background of 50 highly successful years of automobile manufacturing experience stand many enviable achievements of the Packard Motor Car Company — achievements in fine car manufacturing that often set the pace for other members of the industry. To fully understand and appreciate the reasons for the many outstanding achievements by Packard it is necessary to look beyond the beautiful body styling, the gleaming finishes and the luxurious upholstering fabrics and examine at close range the processing of parts that are used in the powerful motor, transmission, and drive.

In this regard, Packard engineers have long recognized the vital importance of properly heat treated gears, cams, bearing surfaces, forgings, and so on, and have brought to the forefront all their skill and ingenuity in working with designers of heat treating equipment to devise the most efficient methods of processing this work. As a result, only the latest and best heat treating methods and equipment are to be found in operation in the plant. Some of the more important heat treating jobs have been selected for discussion and these operations form the basis of the following article.

Heat treating operations at the

Packard plant involve the use of specially designed equipment which is fitted into the production line manufacturing operations for processing a specific part as well as standard equipment located in a general heat treating department for processing a wide variety of parts. Wherever it has been found most practical to incorporate heat treating equipment in the production line manufacturing operations, specially designed equipment has been procured for these operations. For example, it has proved more advantageous to harden the cam and certain bearing surfaces on the Packard camshafts in equipment located in an area adjacent to the camshaft machining and grinding department rather than to transfer these parts to the general heat treating department for hardening and then return them to the engine assembly department. Figure 1 shows a view of the Tocco induction heating machine which is located in the camshaft production line. Built in the compact form of a cabinet with eight doors that provide access to individual compartments, this unit is equipped to receive two shafts in each compartment. The operator places the shafts vertically between specially designed holding fixtures that provide for rotation of the work during the heating and quenching cycle. With the workpieces rotating, the inductor coil and quenching apparatus move progressively upward, pause for a pre-arranged length of time at each surface to be heated and quenched, then move up to the next surface. The operation of the machine is timed so that the operator may continuously load and unload the shafts without interruption. By the time the eighth compartment has been loaded with two shafts, the required number of surfaces on shafts in compartment No. 1 are hardened and ready to be unloaded.

Altogether, sixteen cam surfaces, one oil pump gear and an eccentric which operates the gas pump are hardened. To assure complete hardening out to the tips of the cam surfaces, the heat is built up in the manner required for a circular surface but is then held

Fig. 1—A total of 18 areas on the Packard camshaft are hardened in the Tocco induction hardening machine shown here.

Fig. 2 — Transmission drive shafts are hardened in this Tocco induction hardening machine.

momentarily until the tip of the cam surface is brought up to proper heat after which it is quenched.

Induction hardening of transmission drive shafts is carried out in the Tocco induction hardening machine shown in Fig. 2. Four areas on the shaft require hardening — an end bearing surface, two short sections of a spline, and the clutch shaft end. To position the shafts for heating, the operator places the shaft between a pair of vertically positioned centering pins. These pins are mounted on a holder which is automatically indexed downward during the heating cycle. With the inductor coil located in a fixed position surrounding the workpiece and a current of 380 amps at 500 volts applied, the shaft is automatically stopped in the downward movement at the area to be heated, brought up to the heat desired, quenched with water and indexed to the next position until all four areas have been heated and quenched. The entire cycle required 40 seconds. After hardening, the shafts are transferred to the grinding department where both the treated and untreated surfaces are ground to finish size.

Packard flywheel ring gears derive their basic long wearing qualities from the SAE 1050 steel from which they are machined and, too, from the surface hardening treatment to which they are subjected. Figure 3 shows a view of the electronically controlled, gas selective surface hardening machine in which the ring gears are hardened. Marketed by The Cincinnati Milling Machine Co. under the name Cincinnati Flamatic Hardening Machine, this automatic, high production machine hardens only the surfaces desired, holding the pre-quench temperature of the hardened portion within 10 degrees. The remaining portion of the gear is not affected by the operation, consequently the core properties are retained. Through the application of the Flamatic technique in hardening, it is possible to machine the gears more closely to the finished dimensions than was possible with previously used methods. The only manual operations required consist of loading the mandrel and pressing a button. After the gear is brought up to the proper heat as measured by an electronic temperature meter which is focussed on the teeth of the gear, the flame is auto-

matically extinguished. The gear is then automatically pushed from its mandrel mounting and drops into an enclosed quenching reservoir. A provision is made for automatically conveying the gears out of the quench. Production on the hardened ring gears averages 120 gears per hour.

High production in the general heat treating department has been achieved through the application of a variable time heating cycle within a single gas-fired, radiant tube, carburizing furnace. Two conveyor lines, operating individually at separate speeds, provide for a long cycle of 9 hours and 30 minutes and a short cycle of 6 hours and 20 minutes. A case of 0.035 to 0.040 inch required on parts such as ball races, drive pinions, gear clusters, and so on, is assured in the long cycle heating. The short cycle, on the other hand, provides for heating to achieve a depth of case ranging between 0.025 to 0.030 inch on the pitch line of the gear teeth.

The carburizing furnace, designed and manufactured by Holcroft and Company, is of the five-zone type with each zone being individually controlled for temperature. In the first two zones the parts are gradually brought up to temperature. The third and fourth zones are maintained at 1700 deg. F. while the fifth and last zone is operated at 1450 deg. F. Figure 4 shows a view of the unloading end of the furnace. The carburizing atmosphere introduced into the heating zones is composed of generator gas as the carrier, enriched with propane. Specifically, the mixture used is in the proportion of 40 feet of propane to 1000 feet of generator gas. The dew point of the mixture is maintained between 0° F. and 10° F.

The workpieces to be hardened are located on specially designed trays which are then placed on either the long or the short cycle furnace conveyor, depending upon the type of workpiece and the depth of case desired. Upon completion of the heating cycle, the trays are projected into a vestibule which is located adjacent to the end of the furnace. Figure 5 shows a view of a tray of parts leaving the vestibule and descending into the oil quench on a special lowering device. Thorough quenching of the nested parts on the tray is assured through the use of a special motor driven propeller located at the bottom of the quench tank. As shown in the diagrammatic sketch Fig. 6, a set of curved

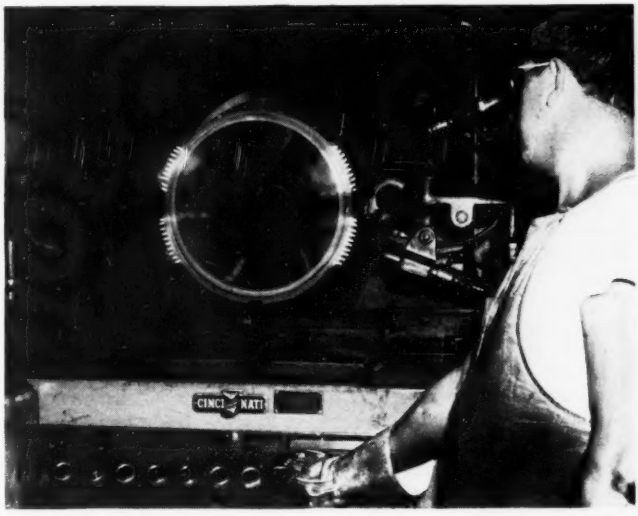


Fig. 3 — View of Cincinnati Flamatic Hardening machine which was designed for flame hardening ring gears.

baffle plates have been installed inside the tank directly in front of the propeller. With the propeller rotating, the cool, quenching oil at the bottom of the tank is forced through the baffles and upward through the tray of parts. An effective and uniform quenching of all parts with minimum distortion is accomplished by the use of this quenching system. Quenching time is 90 seconds.

the trays along with the workpieces. A test piece is removed from a tray as it leaves the oil quench; a section of the test piece is surface ground and then tested on a Rockwell hardness tester. Test pieces which are processed through the short cycle are ground to a depth of 0.015 inch and with this amount removed must give a hardness reading of between 58 and 61 Rockwell C to meet the hardness standard. Like-

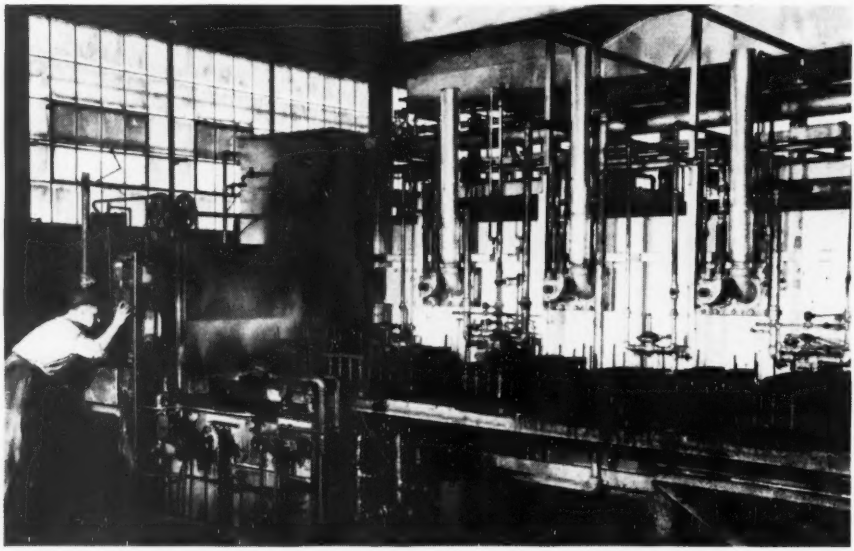


Fig. 4—Illustration showing unloading end of five-zone, variable-cycle, carburizing furnace.

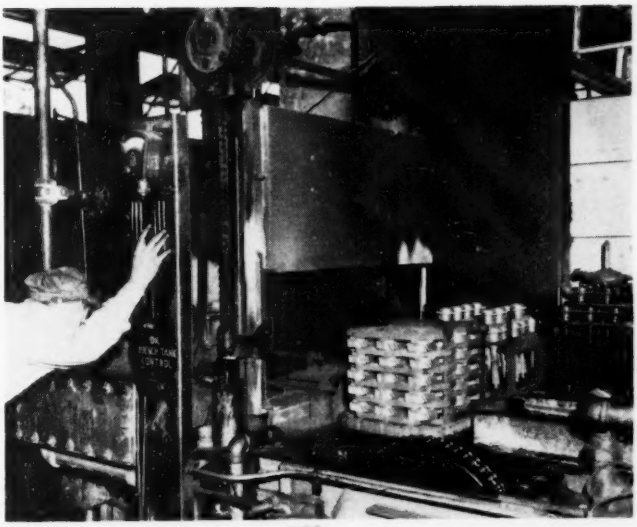
After quenching, the tray of parts is conveyed to a water rinse and then to the drawing furnace. Temperature in the drawing furnace is maintained at 350 deg. Fahrenheit. The trays of parts remain in the drawing furnace for 98 minutes.

In line with the Packard policy of administering precise control over all heat treating operations, regular hardness spot checks of the work processed in the two-cycle furnace are made by means of test pieces that are placed in

wise, test pieces from the long cycle from which 0.023 inch of the hardened surface is removed by grinding must register a similar hardness. Failure of the test piece to meet this hardness requirement indicates that corrective measures must be made.

The rear axle drive gear is heated in a carburizing atmosphere in a furnace located in the general heat treating department. At the exit end of the furnace, four Gleason quenching presses are provided, the purpose of which

Fig. 5—Close-up view of unloading end of carburizing furnace.



is to provide for the straightening of the gears during the quenching operation should they have become distorted during heating and to prevent distortion during quenching. The lower die of the press is divided into six segments with a center cone-like surface which spreads outward and against the inside surface of the gear to hold it firmly in place. The upper die is solid and presses against the gear teeth when the ram in which it is fastened is moved downward to contact the work. The operator removes the gears from the furnace conveyor and places them on the lower segmented die as shown in Fig. 7. When the start button of the machine is pushed, the lower die on its platform moves rearward into the throat of the press. The upper die then moves down against the workpiece as quenching oil is forced up through the segments in the lower die to quench the gear. A heavy shot of oil is forced against the gear for five seconds followed for a period of 15 seconds with a lighter flow after which the gear is held for an additional 15 seconds to assure complete removal of any distortion.

Since the size of the gears varies with the size of the differential drive

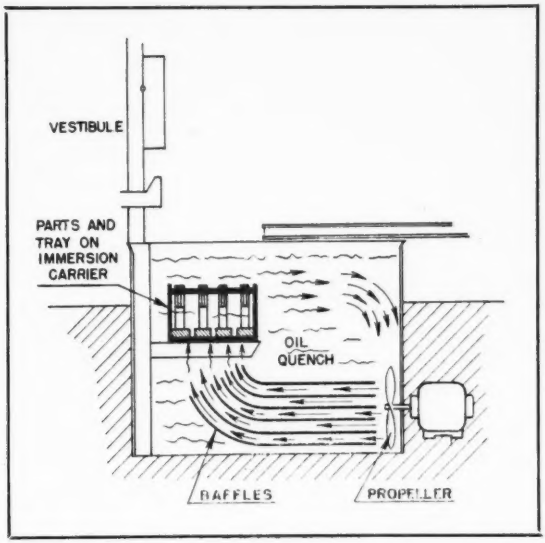


Fig. 6—Sketch of quenching tank.

Fig. 7—After heating, Packard differential drive gears are quenched in the Gleason quench presses shown here.

in which they are used, separate sets of dies are provided for use in the Gleason presses when necessary.

Many parts in the new Packard automatic transmission are small in size and with light sections which must be held to minimium distortion in heat treating. Figure 8 shows a view of the new Dow Carbo Nitriding furnace which was designed specifically for hardening such parts. In this furnace, a carburizing atmosphere is introduced with the addition of ammonia gas with the result that a hard case is obtained similar to that obtained in cyaniding. The outstanding feature of this furnace and process is that light parts such as these can be given this hard surface with an oil quench and consequently low distortion without heating above 1500 deg. F. This type of case will harden in oil even if allowed to cool to as low as 1200 deg. F. before quenching. Of equal importance, however, is the saving in handling time made possible by the efficient design and good engineering on this furnace.

In addition to the facilities for heat treating described in the preceding paragraphs, Packard also maintains a

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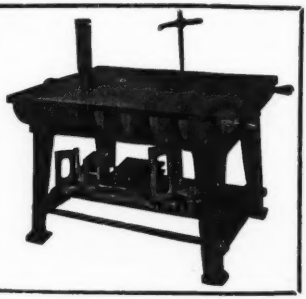

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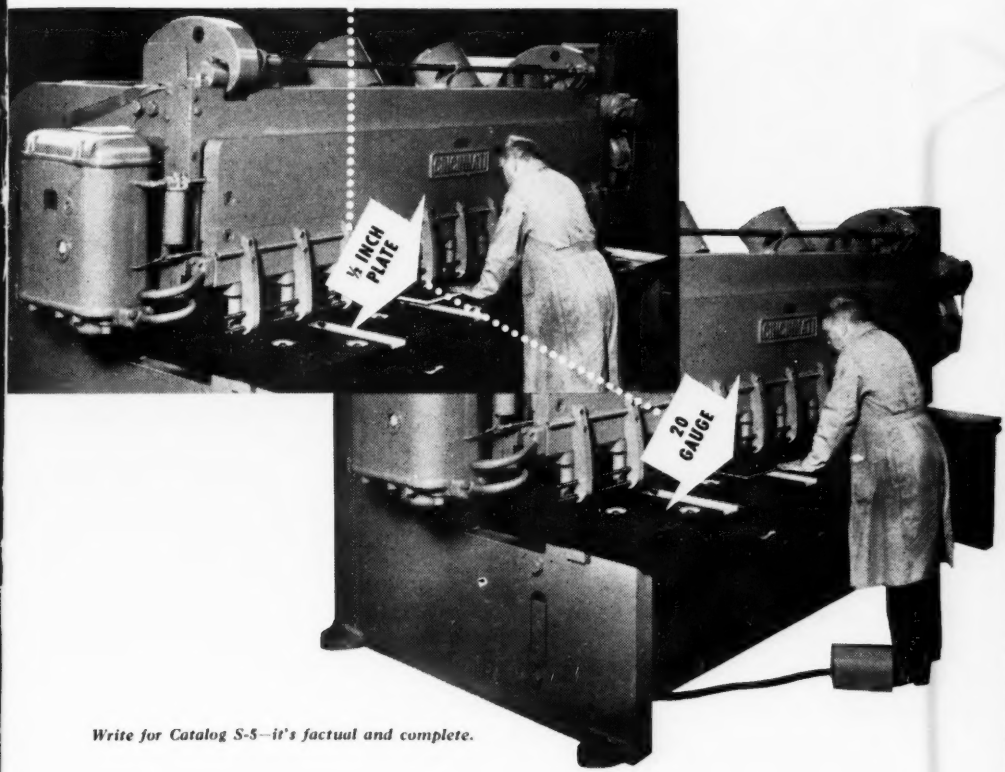

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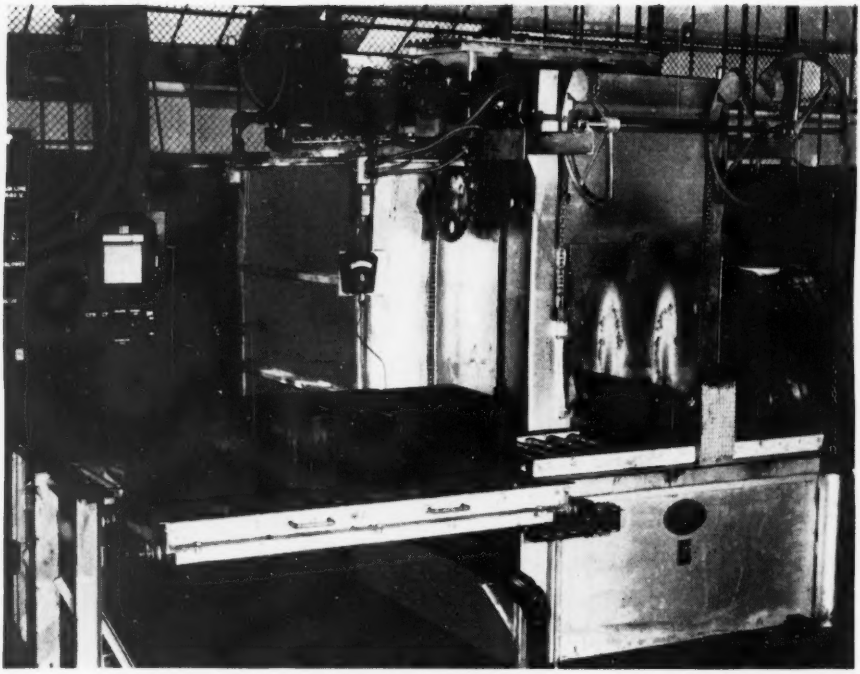

Fig. 8—General view of Dow Carbo Nitriding furnace in which Packard automatic transmission parts are heat treated.

large department in which forgings are treated. A total of 131 pounds of forgings are used in each Packard car and of this amount 81 pounds of the forgings are normalized, 36 pounds are quenched and drawn and the remaining 14 pounds used in the as-forged condition.

Hydraulic Oil Handbook. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa., has issued a revised edition of the "Houghton Handbook on Hydraulic Oils." Attractively bound in orange and blue, the new edition has one outstanding addition—a chapter on flushing of hydraulic systems which discusses the different procedures used in flushing hydraulic systems that have become contaminated and recommends an improved procedure. Other chapters in the revised book deal with hydraulic oil specifications, the importance of properties not in specifications, additive treatment of hydraulic oils, trouble shooting, the qualities necessary in a good hydraulic oil, and Hydro-drive hydraulic oils.

Die-Less Duplicating. A new 40-page edition of its catalog on the "Di-Arco System of Die-Less Duplicating" has been announced by the O'Neil-Irwin Mfg. Co., 306 Eighth Ave., Lake City, Minn. Beginning with a discussion on the origin of the system, the catalog (No. 49-15) then explains the function of "Die-Less Duplicating," after which illustrated, descriptive, and tabular data are presented on the various Di-Arco precision machines, including rod parters, benders, shears, punches, notchers, brakes, and radius brakes.

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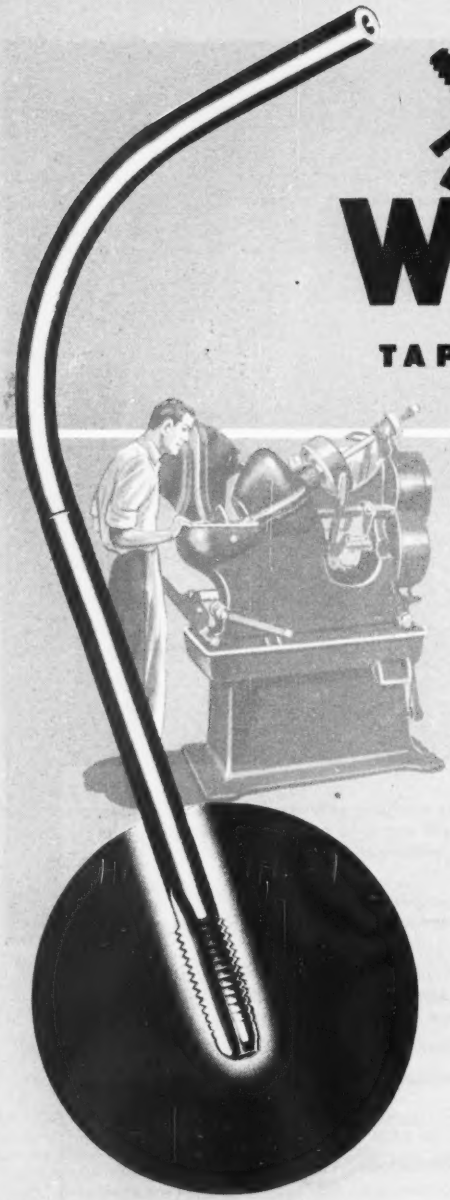

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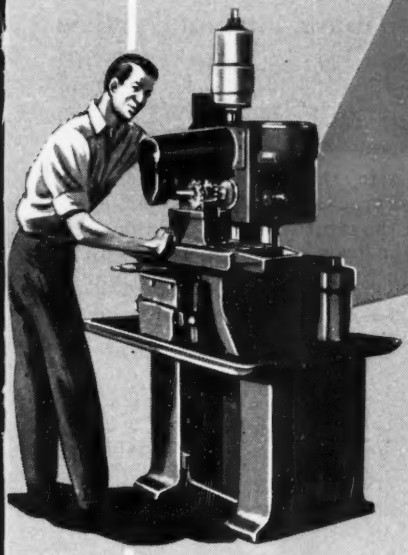

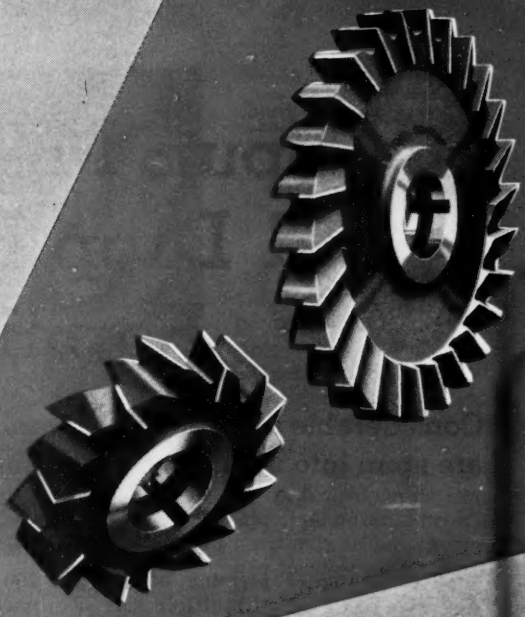

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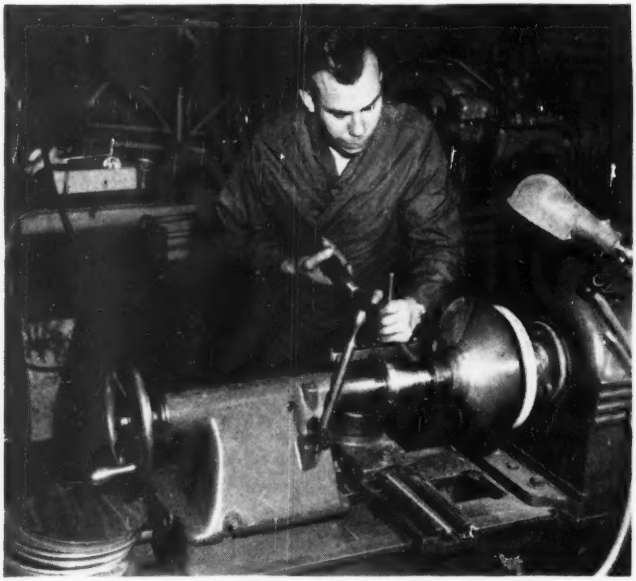
Pre-Spun Metal Shapes Aid Drop Hammer Forming

Considerable savings made possible when flat metal sheets are spun into neutral shapes prior to drop hammer forming

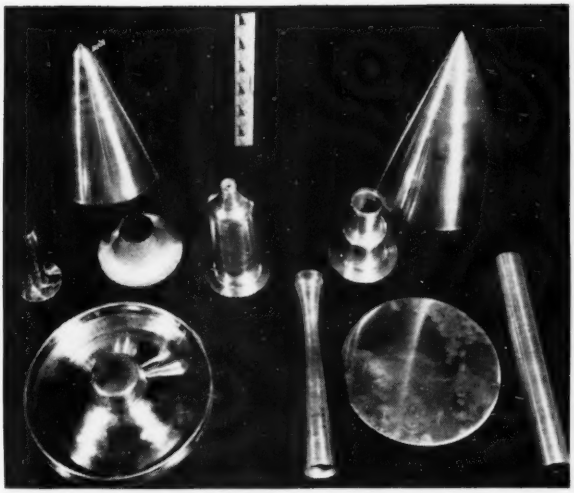
By Gilbert C. Close

DROP hammer forming of short-run parts when multiple sets of staging dies are required is always a costly production process. When the cost of from 5 to 10 sets of staging dies must be amortized over 50, 100, or even 200 parts, the cost of the individual part skyrockets like a V-2 bomb headed for the stratosphere. The same holds true for draw press dies which will be used to produce an extremely limited number of parts.

This high cost factor has always been a headache in the aircraft industry where most production orders will call for between 5 to 100 airplanes. The same high cost factor is experienced by other



Neutral shapes are spun on a conventional shop lathe. Note form block to right of partially spun shape. Pressure of the spinning tool causes metal to "flow" and assume desired shape.



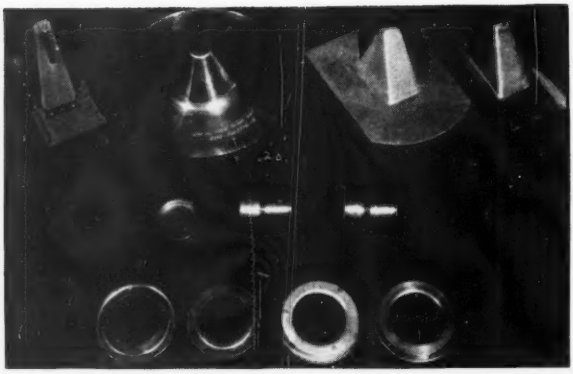
Typical experimental spinnings used in development of optimum neutral shapes for subsequent drop hammer forming.

types of industry where hammer forming is employed and where similar products produced are few in number. In the automobile industry, and in other mass production industries where thousands of duplicate parts are hammer formed, the amortization cost of staging dies becomes a negligible factor.

Approximately 1½ years ago H. W. Snook, engineer at the El Segundo plant of Douglas Aircraft Co., formulated a plan to spin flat metal sheets into neutral shapes prior to drop hammer forming. It was Snook's contention that during this prespinning process, the sheets could be given a shape that would eliminate the use of several sets of drop hammer staging dies. It was also considered that during spinning, metal thickness could be so controlled that a large proportion of thinning caused by localized draw during subsequent hammer forming would be offset.

Now, after 18 months of practical operation and application, Snook's once empirical theory has become established as an accepted production practice. Dozens of hammer formed parts used on the AD-1 Skyraider, the carrier-based attack bomber produced at El Segundo, are transition stamp-

H. W. Snook, Douglas El Segundo engineer, displays a spun neutral shape and the finished part produced from it by transition drop hammer forming.



This photo illustrates unit development of parts made possible by pre-spinning. Upper row—(left to right) 1. Partially formed and riveted assembly used before pre-spinning. 2. Neutral spun shape used for drop hammer forming. 3. Transition stamping from neutral shape. 4. Finished unit part as now used. Center row (left to right) Flanged tube with cap as formerly employed, and closed-end flanged tube made possible by pre-spinning. Lower row (left to right) 1, 2, and 3 show part development by two hammer formings and subsequent welding. 4. Same part developed in whole by spinning.

ings from neutral shapes spun prior to hammer forming.

A single illustration will indicate the savings that pre-spinning can accomplish. Prior to inauguration of the spinning process, a small aluminum micro-switch box required 9 sets of drop hammer staging dies. Many boxes were broken during forming due to the deep draw involved. By pre-spinning the metal into a neutral hat-shape, only 3 sets of staging dies are required to complete the part. Furthermore, distribution of the metal in the spun part is so controlled that rupture or breakage during subsequent hammer work is very rare.

According to Snook, there is no set formula for the shape of the pre-spun part, but gradually increasing experience in this type of work is narrowing the range of trial-and-error experimentation which was necessary when the spinning department was first organized. The metal spinner and tooling drop hammer production man work together in developing the right shaped form block for each new part to be produced. Usually two or three trial spinnings with subsequent transition hammer forming are enough to illustrate the best neutral shape to use, and the best distribution of metal to eliminate excessive thinning caused by localized hammer draw.

A word of explanation may aid those not acquainted with metal spinning to visualize how this process works. In spinning, flat circular sheet of metal is chucked in a spinning lathe adjacent to a form block approximating the desired shape of the finished part. As the lathe rotates, a spinning tool fabricated either from steel or wood, is pressed against the flat sheet opposite the form block. Pressure of the spinning tool causes the metal to "flow," and the flat sheet is gradually forced over onto and assumes the shape of the form block.

During spinning, an experienced operator can control metal thickness by causing it to flow back and forth according to manipulations of the spinning tool. Thus it is possible to obtain thicker sections in those portions of the neutral shape which will undergo severe localized draw during subsequent hammer work. The term "neutral shape" is used because all spun metal parts are uniformly round and wall thickness of the part on a given plane is the same throughout the periphery.

There is nothing elaborate or costly about the Douglas El Segundo spinning department. A Pryibil spinning lathe with a 22-inch closed bed and 44-inch open bed is used for spinning the larger shapes. This lathe was modified by

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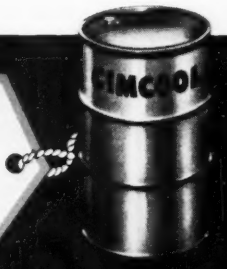

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Neutral shape in place on hammer die for transition stamping. One set of dies accomplishes the job.

equipping it with a three-speed transmission which, in conjunction with a variable drive, gives an infinite variety of speeds between 40 and 1800 rpm. In addition to the Pryibil lathe, the department contains three ordinary shop lathes with which smaller shapes may be spun. Conventional wood, steel, and Carboloy spinning tools are used.

Most form blocks are fabricated right in the department. Form block material may be maple, birch, Masonite, aluminum, Kirksite, or steel, depending upon the severity of the spinning process and the number of parts required. Laminated Masonite has been found an excellent material for form block fabrication when the spinning operation is severe. When a large number of parts will be spun, the long-wearing quality of metal form blocks is employed.

Wood form blocks are most often used in developing experimental shapes. The wood blocks are easy to modify until the right neutral shape is obtained. In certain instances, where spinning will be carried out to the extremes of straight-walled work, two or three breakdowns are necessary. This means that two or three form blocks, each approaching the shape of the finished part, must be used. When the spun part is of such a shape that the form block cannot be removed from it, such as a spun shell with a larger center diameter than end opening, split form blocks are used. These blocks are made in sections and are removed from the finished part a section at a time.

The aluminum alloys are the most common materials with which the department has to work. When possible, 61S aluminum alloy in the "O" condition for stressed parts and 3S alloy in the fully annealed condition for unstressed parts, are used. These alloys are easy to spin, and very little springback is experienced during the spinning process.

In some cases 24ST, 61ST, 61SW, and 24ST Alclad sheet have been spun successfully. In spinning Alclad, however, the pure aluminum protective coating is ruined and the underlying Dural is left exposed. Therefore the finished part must be surface treated and finished like ordinary Dural sheet. Aluminum sheet material up to 0.128-inch gage has been used.

Other metals which are occasionally spun include brass, terneplate, and 1025 carbon steel. Hot spinning of mag-

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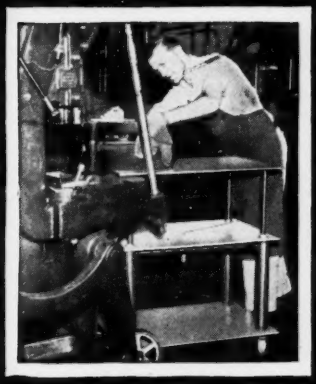

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Left — External fuel tank formed in two parts which must be welded together. Right — Two sections of external tank formed in whole by spinning.

nesium alloy FS-1a has been successfully accomplished. The magnesium sheet is pre-heated with a torch, but so far no accurate determination of optimum spinning temperature has been made.

In a few cases completed parts not requiring subsequent drop hammer forming have been turned out. One such part is a large flanged ring used as a slip joint on turbo-jet engine blast tubes. This part, approximately 20 inches in diameter and 6 inches wide with a flange protruding around the center periphery, is spun from 18-8 stainless steel. The initial gage of the stainless steel is 0.050 inch, but during spinning this gage is reduced to approximately 0.040 inch due to drawing of the metal during the spinning operation.

A certain amount of work hardening occurs during spinning of most metals. The amount of hardening depends to a large extent upon the severity of the operation and the amount of draw that is necessary. Quite often it is found expedient to anneal parts in a partially spun condition. This is the usual practice when more than one breakdown is required, and when the metal being used is especially susceptible to work hardenability. The stainless steel blast tube ring mentioned above is annealed three times during the spinning process. By annealing to relieve work hardness, a considerable proportion of springback is eliminated, thus making it possible to lay the metal more accurately against the form block and obtain parts of very close tolerance.

It has been found that by pre-spinning neutral shapes, many parts can be formed in whole that otherwise would have to be drop hammer formed in part components then joined by welding. More specifically, parts can be formed by transition stamping from spun neutral shapes which could not be formed in whole from flat sheet stock regardless of the number of staging dies used. One such part currently in production is a bomb rack fairing nose for the AD-1 Skyraider. Prior to spinning, this part had to be formed in two sections then joined by welding. Now a spun neutral shape is used and the fairing nose is formed in whole. This not only

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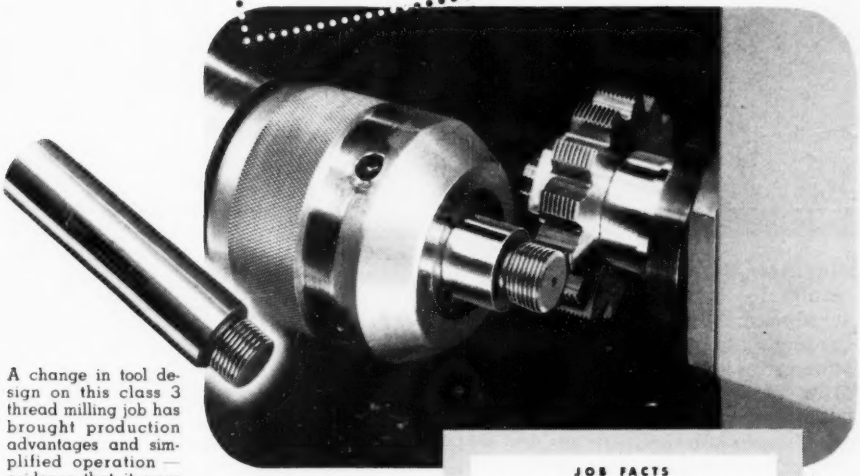

A change in tool design on this class 3 thread milling job has brought production advantages and simplified operation — evidence that it pays to use cutters designed to suit the job conditions.

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	5 sharp.,	15 sharp.,
	100 pces.	150 pces.
	per sharp.	per sharp.

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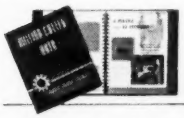

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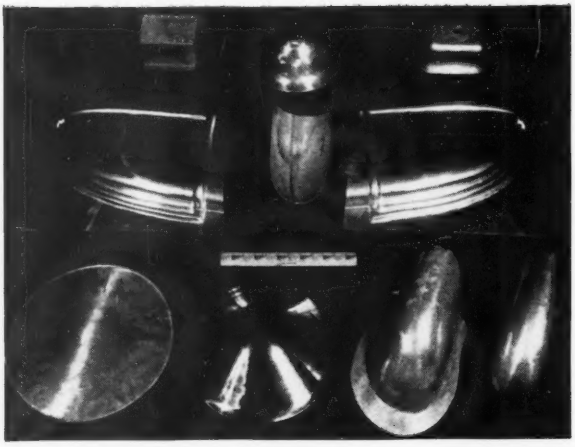

Upper row (left to right) 1. Riveted micro-switch box. 2. Spun neutral shape for producing formed box. 3. Transition stamping from neutral shape. Center row — Two halves of bomb rack fairing nose and final welded assembly as formerly produced. Bottom row (left to right) Flat sheet, spun neutral shape, transition stamping, and finished bomb rack fairing nose as it is now produced.

eliminates the necessity of welding, but results in a stronger part which is aerodynamically clean. Distribution of the metal in the spun neutral shape offsets the severity of localized metal draw during hammer finishing. Some parts now produced by hammer forming from spun neutral shapes were formerly riveted assemblies. No attempt had been made to produce them on the drop hammer due to the severity of the draws involved.

Another advantage that accrues from equal metal distribution throughout the pre-spun part is that this factor aids greatly in shrinking during subsequent hammer hits. Very few wrinkles are formed, and planishing is held to a minimum.

Among parts being pre-spun at this time are micro-switch boxes, oil tank sections, external storage tanks, filler neck wells, landing gear knuckle fairings, bomb rack fairing noses, and other components which require an excessive number of drop hammer staging dies and which lend themselves to neutral shape forming. The illustrations which accompany this article serve to illustrate vividly the possibilities inherent of this pre-spinning process. None of these parts is produced in sufficiently great quantities to offset the cost of draw press dies, and by pre-spinning, costs are further reduced by a reduction in the number of drop hammer staging dies required.

There is one point, however, that should not be overlooked regarding this pre-spinning process. Success in the operation depends entirely upon the

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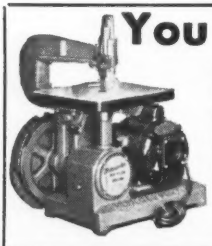

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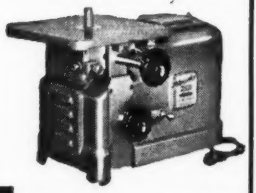

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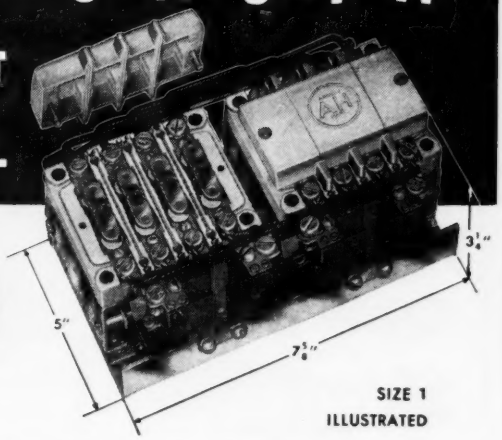

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closest cooperation between the metal spinners and drop hammer production experts. This practically necessitates development of a spinning department within the plant so that such cooperation is possible.

Furthermore, on short-run parts, the cost of sub-contracted pre-spinning work would be prohibitive. It would cost the sub-contractor just as much to develop form blocks and techniques for a dozen parts as it would for 10,000, and any savings realized from pre-spinning work would soon be absorbed by sub-contractor charges.

Fortunately, a spinning department can be organized and put in operation very cheaply. The only specialized tooling required is a spinning lathe for larger parts and a set of spinning tools. Conventional lathes, usually available in the larger machine shops, can be used for spinning small parts. But there is one point that should be remembered—metal spinning is a highly personalized operation. There are no set formulas or automatic operations for forming a part. This is up to the "feel" and experience of the spinner himself. This means that at least one experienced metal spinner must be available when the department is placed in operation. Minus this experience, a long and perhaps discouraging period of experimentation and practice would precede successful results.

(All Photos courtesy of El Segundo plant of Douglas Aircraft Company.)

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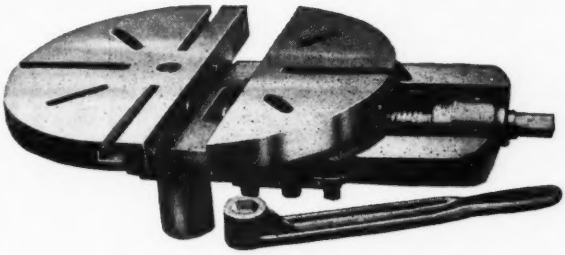

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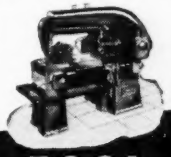

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Induction Hardening, Part I

Fundamental considerations for the heating and quenching of steel parts

By Frank W. Curtis

THE hardening of steel parts is one of the most important applications of induction heating. The shapes of the parts and the areas to be heated are important factors to be considered in this method of energy transfer; and where only localized surface treatment is required, induction hardening finds its broadest use. In general, parts which must be hardened either throughout or on all surfaces—with the exception of those which are comparatively small in size—do not normally lend themselves to this form of treatment. Yet on occasion, small intricately shaped parts, which would be difficult to harden by other standard means, may be induction hardened throughout. Basically, however, induction hardening may be said to be a selected means of heat treatment which is intended primarily for the surface hardening of localized areas rather than for general-purpose heat treatment.

The use of induction hardening on those parts which may be treated by this method presents many definite advantages. These advantages include (1) rapid heating which, in turn, promotes the possibility of large production, (2) uniform control so that rejections may be reduced or elimi-

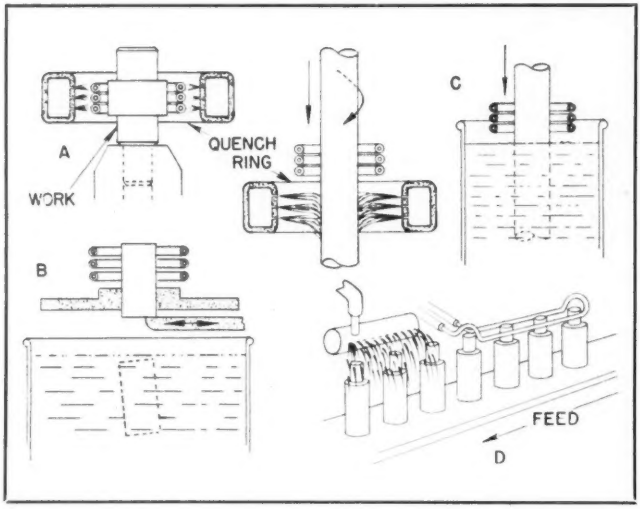

Fig. 1 — Drawing shows heating and quenching methods which are frequently used for induction hardening.

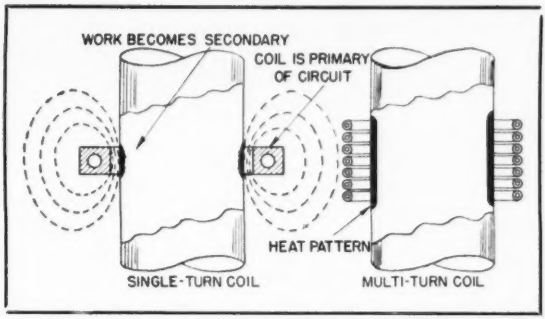

Fig. 2—The two basic types of coils which are used for hardening are sketched here.

nated, and (3) economical heating costs, especially where only localized areas are treated. When heat treatment is confined to localized surfaces, which might very possibly represent only a small area of a relatively large part, deformation and warpage, which are common conditions encountered with other forms of treatment, are either minimized or eliminated. With induction hardening, there is also less scale formation which, in turn, reduces cleaning costs.

The speed at which a metal part may be heated depends upon several factors, the more important being (1) the relation of the available power to the area being heated, referred to as kilowatts per square inch; (2) the type of work coil used and its location with respect to the surface of the work; and (3) the resistivity of the metal being heated. Since the resistivity of most steels is approximately the same, power output and coil characteristics are the basic items to be considered in determining the speed of heating steel workpieces.

It is obvious that there must be a sufficient amount of electrical energy flowing through a coil in order to generate the desired amount of heat in the surface of a given workpiece. The number of heat units required, whether expressed in Btu per minute or in kilowatts (1 kw. = 56.89 Btu per minute), will depend upon the size of the workpiece, the nature of the operation, and the temperature required. For example, in the case hardening of steel parts where a fast temperature rise is necessary so that heating is restricted almost entirely to the surface of the work, a value of from five to ten kw. per square inch of surface is usually needed. And in some instances where more restricted case hardnesses are desired, even higher concentrations may be used.

On the other hand, many parts may be hardened satisfactorily by using two to three kw. per square inch of surface.

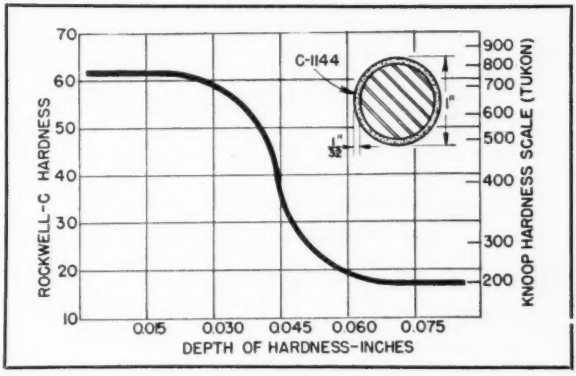

Fig. 3—Graph showing hardness values obtained for an induction hardened workpiece.

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At these lower values, however, unless the parts are small, there will be a greater amount of thermal heat conduction below the surfaces; and the overall heating times will be increased.

The calculation of power required for induction hardening involves a number of factors of which the principal ones are expressed in the following equation:

$$\text{kw.-hours} = \frac{HW\,(T^1 - T^2)A}{3413}$$

where

H = Mean specific heat of the material over the range of temperature $T^1 - T^2$

W = Weight of the workpiece, lb.

T^1 = Hardening temperature, deg. F.

T^2 = Ambient or room temperature, deg. F.

A = Allowance factor for losses.

The loss allowance factor, A, which is in the range of from 1.5 to 2.0, is included to compensate for the heat losses due to conduction and radiation.

For example, in order to heat a one pound section of a steel workpiece, having a mean specific heat of 0.15 and an allowance factor of 2.0, from 70 deg. F. to 1,520 deg. F., the power required is calculated as follows:

$$\text{kw.-hours} = \frac{HW\,(T^1 - T^2)A}{3413}$$

$$= \frac{0.15 \times 1.0 \times (1{,}520 - 70) \times 2.0}{3413}$$

$$= .1275 \text{ kw.-hours}$$

$$= 435 \text{ Btu}$$

If a generator having an output of 1,400 Btu per minute (approximately 25 kw.) is used, the required heating time for the part would be $435/1{,}400 = 0.31$ minutes, or 18.6 seconds. This heating time is based upon the use of a standard coil coupling of approximately $\frac{1}{16}$ to $\frac{1}{8}$ inch such as is required for average local hardening operations.

There are three types of induction heating equipment as used in hardening operations—motor-generator sets, spark-gap converters, and electron-

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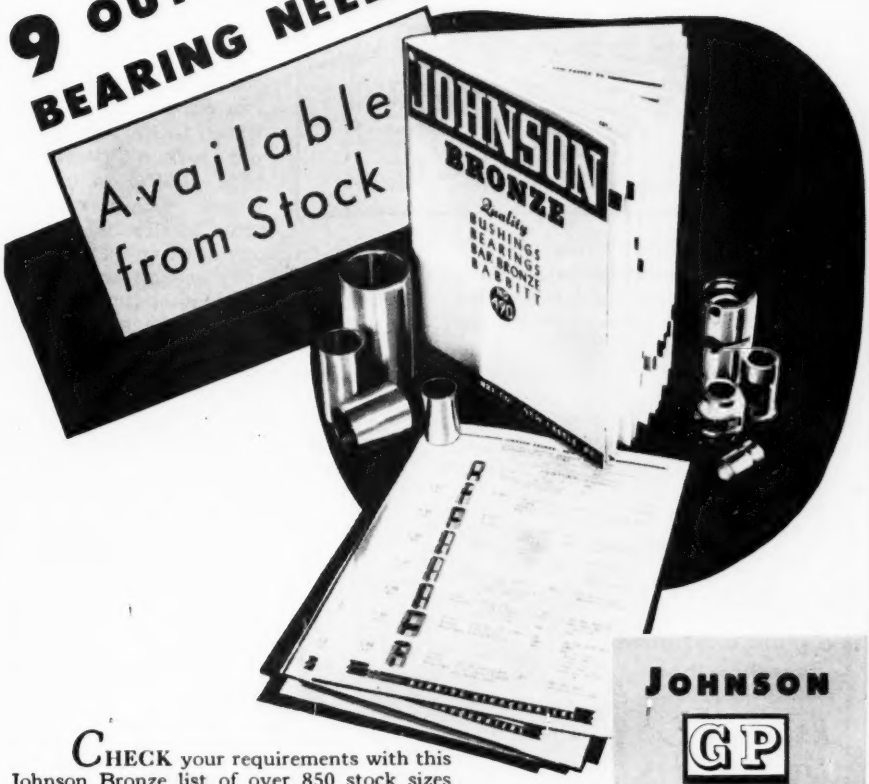

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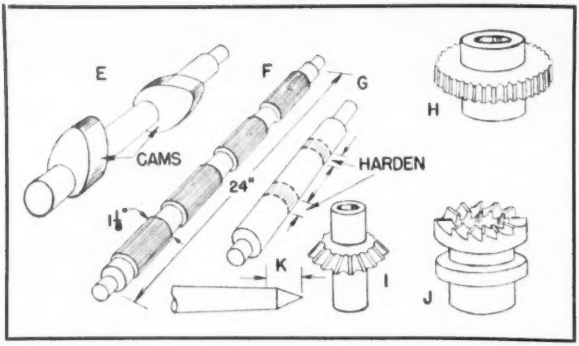

Fig. 4 — Illustrated here are various types of parts which are suited to induction hardening.

tube oscillators. In all three types of equipment, it is possible to obtain a power generating unit combined with a heating station or table at which the work is performed.

Motor-generator sets range in power output ratings from about 10 to 1,200 kw. with frequencies ranging from 960 to 9,600 cycles per second. Spark-gap converters provide power output from about 2 to 20 kw. at frequencies from 50,000 to 150,000 cycles per second. Electron-tube oscillators have power output ratings from 0.75 to 100 kw. or more at frequencies from 100,000 to 500,000 cycles per second or higher. Most of the standard induction hardening installations which are in use at the present time have power output ratings of from 2 to 50 kw.

Hardening Methods

The method of hardening by means of induction heat may be used for a

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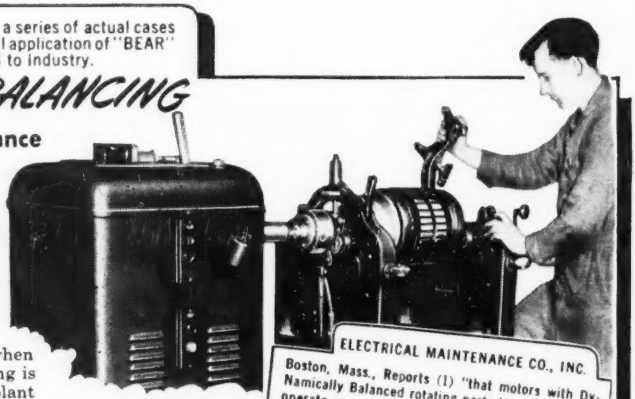

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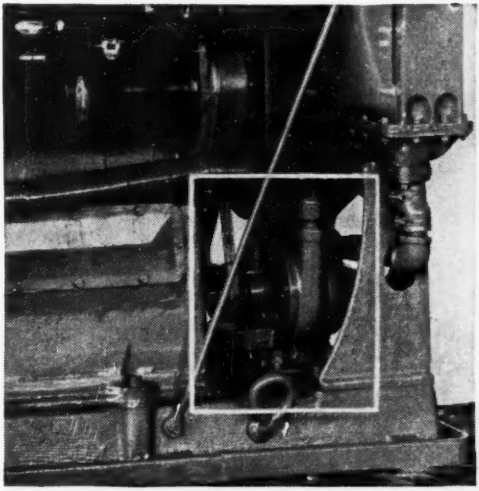

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variety of steels including those which may be air hardened and those which require quenching media, such as water, oil, brine, and the like. For the latter group, two methods of quenching after heating are provided. One method is to use a spray which is applied either from a quench ring or a nozzle, or through the coil itself; the other method is to use immersion into a quench bath which is usually accomplished by lowering or dropping the workpiece from the coil into a tank located directly beneath it.

The hardening methods which are used most generally are illustrated in Fig. 1. A spray quench set-up for surface hardening the center portion of a shaft is shown at **A.** The shaft is placed within a coil and then heated by induction. After the heating cycle is completed, the spray quench is applied automatically which results in an immediate cooling of the heated area. A similar workpiece which is treated by an immersion quench is shown at **B.** After the upper end of the shaft is heated to the proper temperature, it is released into the quench bath directly beneath.

The same choice of quenching methods is also used for progressive hardening, as may be seen at **C** in Fig. 1. The shaft at the left is fed downward vertically through the coil; and, after heating, the heated area is subjected immediately to a spray quench. The shaft on the right is fed similarly through a coil and then submerged directly into a quench bath. Another typical pro-

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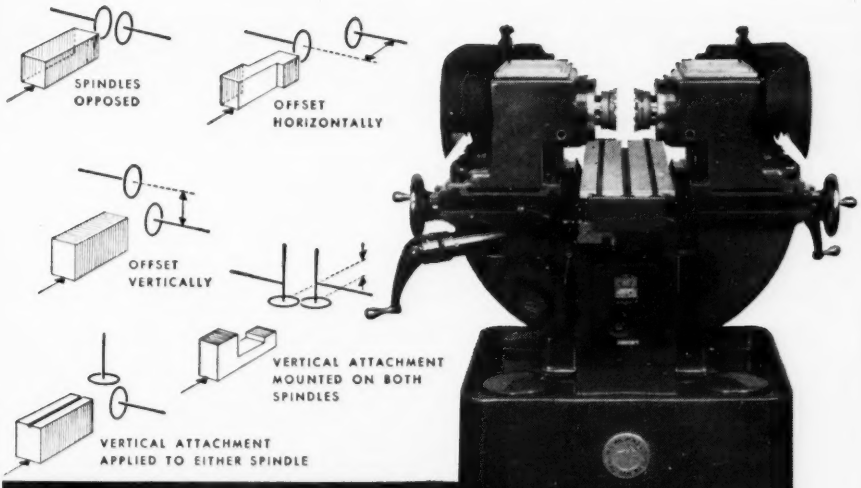

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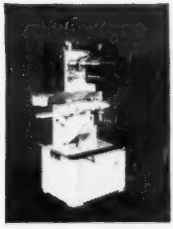

For operations such as those diagrammed at the left, the Nichols Twin Miller offers exceptional economy with greatly increased output. Its rugged, precise construction combined with ample power is ideal for machining simultaneously two surfaces which must be held in accurate relation. The preloaded ball bearing spindles may be positioned horizontally, vertically, and crosswise, independently of each other. A solenoid operated air cylinder feeds the table automatically. Fifteen spindle speeds between 55 and 2080 rpm are available. Condensed specifications are listed below. For full details write Nichols-Morris today.

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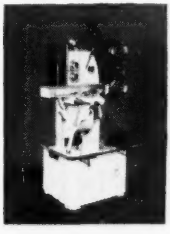

CONDENSED SPECIFICATIONS

Table, working surface	8½" x 30"
Table travel — cutting stroke	12"
Motors	1725 RPM AC reversible 1 HP
Maximum height center of spindle above table	12"
Maximum offset of spindles (horizontal)	9"
Maximum distance between spindle noses (across table)	16"
Overall Dimensions	4' x 5' x 4'7"

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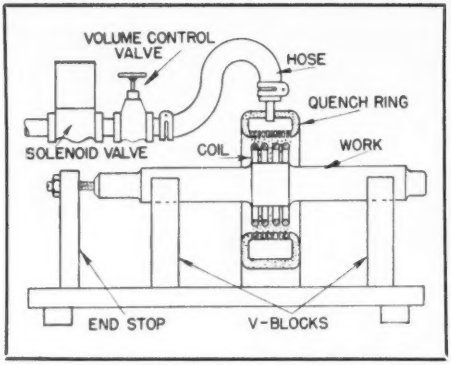

Fig. 5 — Arrangement of a typical spray quench hardening set-up using solenoid and volume-control valves.

gressive hardening set-up is shown at **D**; the equipment is arranged horizontally, and the heated areas of the parts are quenched as they are passed under a spray of either water or oil.

Heating coils which are used for the transfer of high-frequency current to the surfaces of metal parts may be made in a variety of shapes, styles, and sizes. The basic types used for hardening are sketched in Fig. 2; at the left is shown a single-turn coil which is made from a solid piece of metal, and at the right is shown a multi-turn coil which is made from tubing and which may be wound into the shape desired.

It is recommended that pure copper, having a high conductivity of not less than 90 per cent, should be used for the construction of heating coils in order to assure most effective results. Since the primary circuits of coils carry large current, it is necessary to provide for water circulation; about the only exception to this rule would be the case of coils used with small generators having an output of less than one kw. and used for intermittent service.

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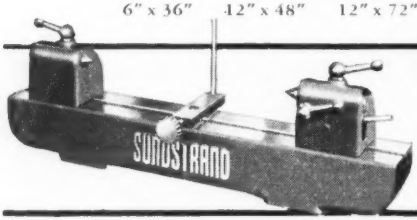

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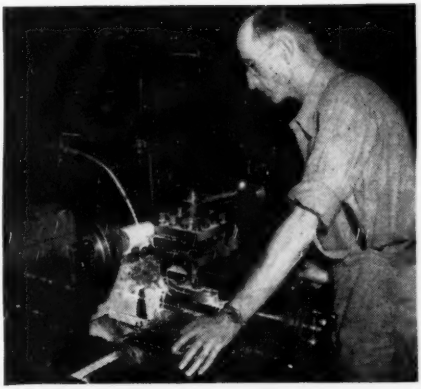

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With high-frequency current flowing in the coil, a flow of energy is induced in the workpiece; and this current flows in a direction which is opposite to the current in the coil. The current in the workpiece flows in closed loops, or eddy currents, which generate heat in relation to the strength of the power being transmitted. The power is equivalent to the square of the current times the effective resistance of the piece being heated, or I^2R. The metal being heated does not become a part of the closed electrical coil circuit so that the generation of heat is accomplished solely by induction.

Heat is generated in conducting materials by means of two classes of resistance losses—eddy-current losses and hysteresis losses. Eddy-current losses result from circulating currents within the materials and are by far the predominating losses which cause metal parts to heat rapidly. Hysteresis losses are caused by friction of adjacent molecules in a given material and are present in magnetic materials only. Hysteresis losses decrease with increasing tempertures and cease to be present when the temperature is raised above the Curie point. Hysteresis losses are small when compared to eddy-current losses, especially at those frequencies used for induction hardening.

The path of magnetic flux around a cylindrical coil is such that the greatest field strength is obtained on the inside of the coil. For this reason, the outside of a part, such as a shaft, which is placed within a cylindrical coil, may be heated

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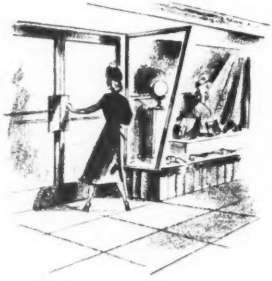

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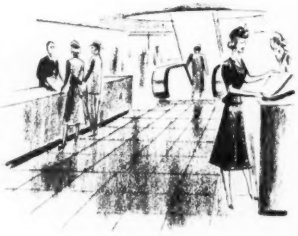

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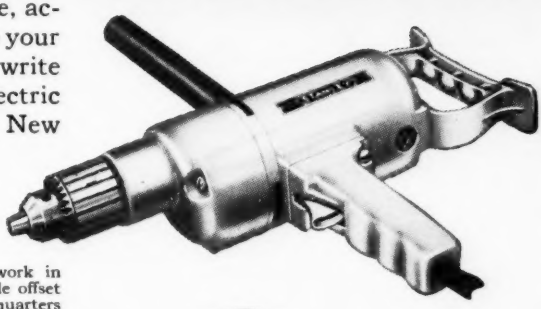

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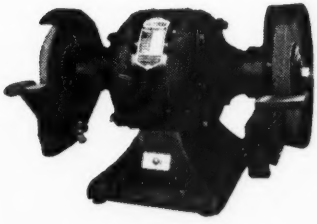

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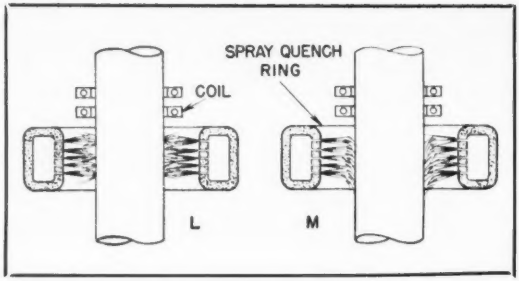

Fig. 6—A spray quench should not be applied with excessive pressure, but it should be sufficient to cover the heated area.

quite rapidly. With flat or pancake-type coils, heating is somewhat slower in comparison; and with internal-type coils, heat generation is still slower because the magnetic flux density is considerably less on the outside of the coil than it is on the inside due to the spreading of the external flux.

Since magnetic fields occur in the area surrounding the coil and are strongest nearest the coil, the work-piece should be placed as close as possible to the coil so that a maximum amount of energy may be transferred from the coil to the work. It has been found that the heating effect is proportional to the squared value of the induced current and inversely proportional to the cross-sectional area of the current path.

In the surface heating of a steel part by means of high-frequency current, the permeability of the material increases as the temperature is raised to the critical, or Curie point—about 1,400 deg. F. At this point, magnetic properties no longer exist. Above this point, the permeability is equal to unity, and the power absorbed on the surface of

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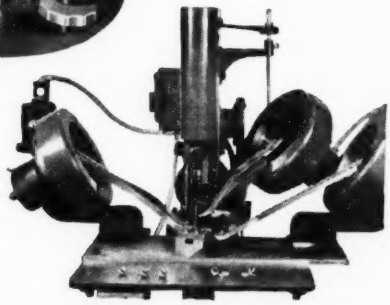

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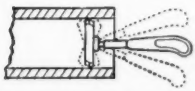

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the workpiece diminishes. This slight drop in the rate of heating is not too noticeable in connection with the hardening of parts which require temperatures of approximately 1,500 to 1,600 deg. Fahrenheit.

Penetration of Current

High-frequency alternating current tends to flow on the surface of a conductor or worpkiece; and the higher the frequency, the more pronounced is this phenomenon, which is often called "skin effect". At a relatively high frequency, a shallow case on a workpiece may be brought to a given temperature faster than if a lower frequency were used. On the other hand, in order to obtain a deeper penetration with a current of high frequency, which is equal to the depth which may be secured with a lower frequency current, more time is required in order to permit the heat to be conducted from the surface to the desired depth of the workpiece.

The relationship between frequency and the diameter of the material to be hardened is an important consideration when treating work of small cross-section. It should be remembered that, in the heating of thin cases or shells, a high concentration of power is as important as is a shallow current penetration. It is desired to produce only a comparatively thin hardened case or skin and not to heat the work completely through, then the theoretical approximate depth of current penetration should be equal to or less than 20 per cent of the work diameter.

There is seldom any strict line of demarcation between the induction heated and hardened area, and the core, or previously heat treated zone. The transition between the two regions is a gradual one since the depth of current penetration decreases exponentially below the surface. Fig. 3 shows graphically the hardness values obtained at various depths of a one inch di-

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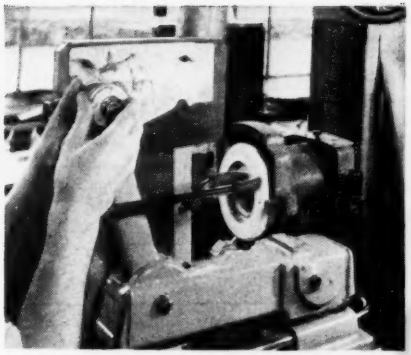

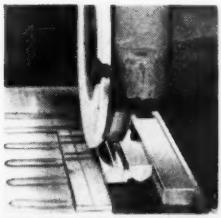

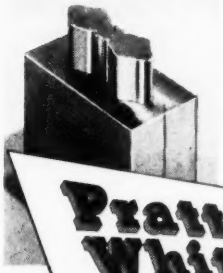

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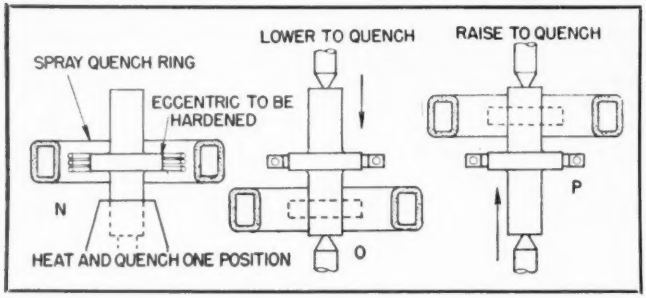
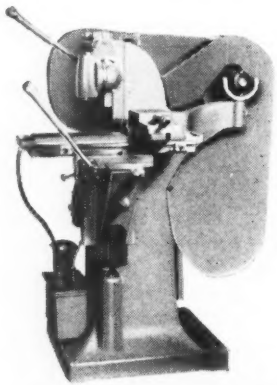


Fig. 7—Work may be elevated to or lowered from the coil to the quench, or it may be heated and quenched in one position.

ameter shaft of C-1144 steel which has been heated by induction; the curve is an indication of the variation in the strength of current density.

Most of the current flows on the surface of the work, and the highest hardness readings are observed in this area; as may be seen, hardness values are decreased as the distance from the outer surface is increased. The depth of case obtained is approximately 0.032 inch, and the hardness value measured on the surface of the work is 62 Rockwell C. Because of the gradient of heat penetration and the uniform distribution of heat, cracking or flaking-off of a hardened area seldom occurs due to the metallurgical structure which exists between the hard martensitic surface, through the intermediate zone, and into the unhardened ferric core.



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Types of Parts Hardened

A variety of typical parts which are suited to treatment by induction hardening are illustrated in Fig. 4. The cam shaft shown at **E** is a standard type of part which is hardened by induction heat; on this part, only the cams require selective hardening. Normally, if the cam shaft were heated all over, it might very possibly become distorted; and the distortion would cause straightening difficulties. With induction hardening, heat is restricted to localized surfaces, and distortion is either negligible or eliminated entirely.

Similar reasoning is applicable to the fluted shaft shown at **F** on which only the serrated areas require hardening. The flutes are progressively hardened by means of induction heating, a skip-stop vertical feeding machine being used so that the intermediate sections, on which hardening is not required, are not heated. By heating a small portion of the shaft at a time, the possibility of distortion is greatly reduced. Two hardened journals, as indicated, are

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required on the shaft shown at **G**; the journals are used as integral races for needle bearings, and the method of hardening these journals by means of localized induction heating has proved to be quite successful.

The teeth of spur gears, such as the one at **H**, and bevel gears, such as the one at **I**, may be effectively hardened by means of induction heat. These gears are representative of a wide variety of such parts which may be treated, providing the parts with clean, scale-free surfaces. The teeth of a clutch, similar to the one shown at **J**, may also be induction hardened; for this part a "pancake" type coil is used instead of a cylindrical coil. Induction hardening is particularly suitable for the hardening of clutch teeth, especially in cases where heavy impact is encountered, because the depth of the case may be made as required while, at the same time, the ductility of the underlying core area is retained for strength. Localized hardening of the ends of shafts, as at **K**, is another application for induction hardening.

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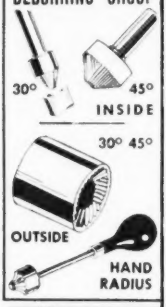

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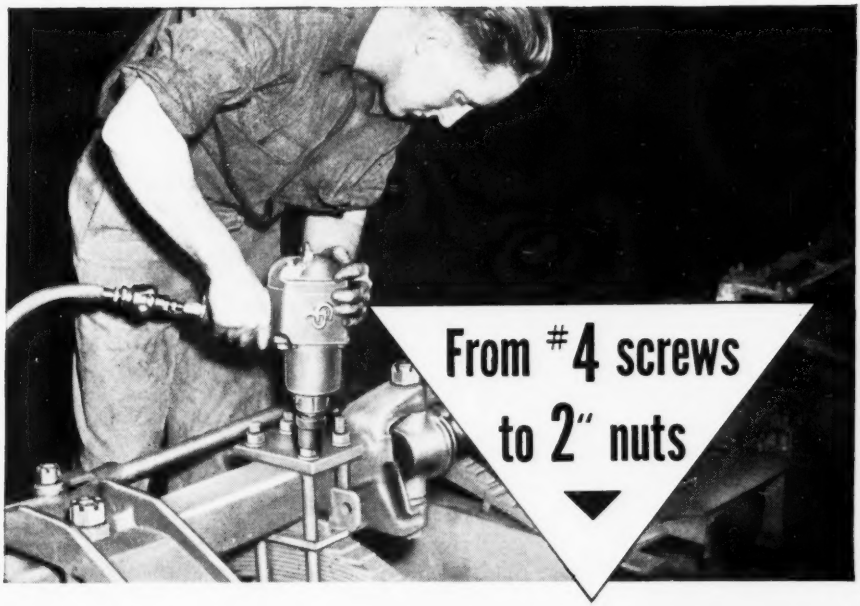
Spray Quenching

Many parts which are suited to induction hardening can be or must be spray quenched. As a rule, a multistage timer is used to control the sequence of operations so that it is necessary for the operator only to load the work and to push a button in order to start a complete cycle of operation. In setting up a new job of hardening, the procedure which is usually followed is to operate both the heat and quench con-



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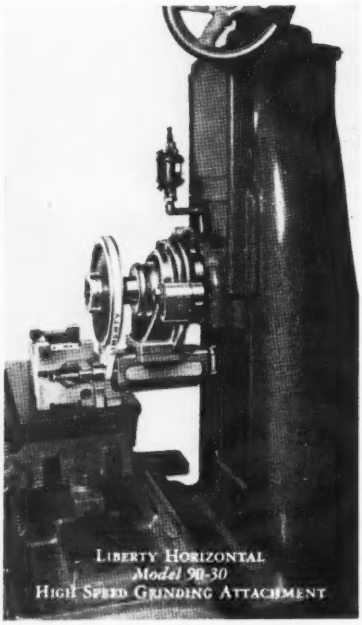

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trols manually for a group of test runs and, for different runs, to vary the heating and quenching times over suitable ranges. The times which are used for the runs are recorded so that, when the optimum hardening results are obtained, the controls governing the automaticity of the equipment may be set accordingly. After the controls are set, subsequent parts may be heated and quenched with the assurance that all of them will be uniform.

The spray quench is usually controlled by means of a solenoid valve which is opened for a stipulated period of time immediately following the heating portion of the operating cycle. The feed line for the quench should include a volume-control valve in order to permit adjustment for the volume and pressure of the quench medium. A typical arrangement of these valves is illustrated in Fig. 5. The volume of coolant should be adjusted to provide an even distribution around the heated area, and it should be applied with enough force to keep the heated surface well covered with the spray.

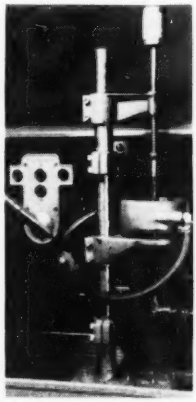
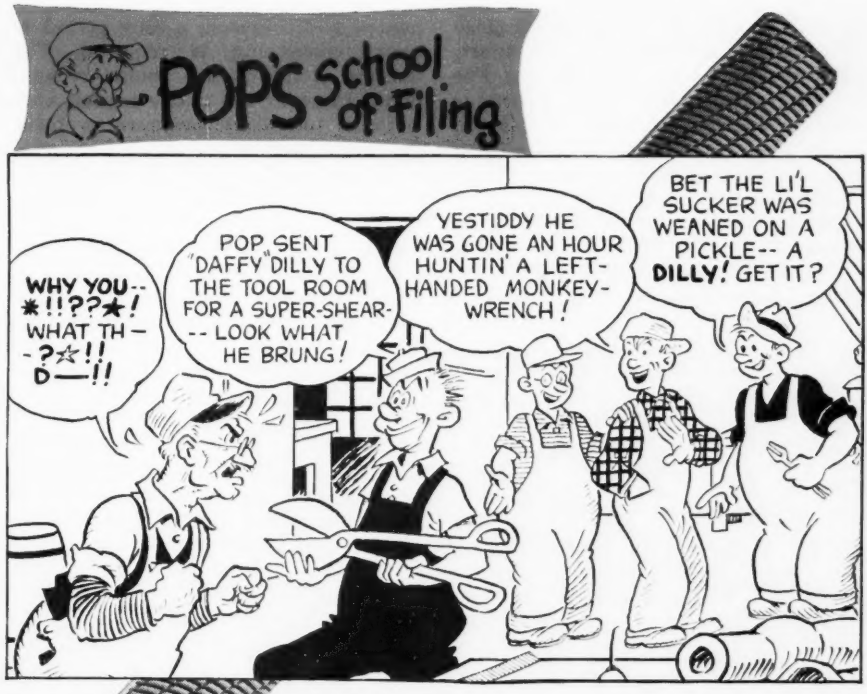


Fig. 8—Illustration of an automatic fixture which is used to raise the work from the coil to the spray quench. *(Courtesy Induction Hardening Corp.)*

Spray quench units may be made in a variety of forms, such as rings, or flat or tubular blocks. The materials used for the units are usually either brass or plastic, plastic being preferred when the quench ring or block must be positioned close to the heating coil since it is not heated as quickly as brass. Spray holes are drilled as need-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ed; but usually they are spaced close together, not exceeding ¼ inch apart, and are under $\frac{1}{16}$ inch in diameter. For average applications, spray openings which are made with a No. 57 or a No. 58 drill prove to be quite satisfactory; but if they are found to be too small, they may be enlarged quite easily.

The relationship of the spray to the heated area is often of primary importance, and it is of particular concern when a large area of a part is heated and therefore a long period of spray quenching is required. The volume of the quench should be adequate to cover the entire heated area without too much pressure or force being applied. If the spray is applied with too high a pressure, the liquid, especially if it is water, has a tendency to deflect away from the heated surfaces, as shown at the left, **L**, in Fig. 6.

The deflection of the spray results in spotty or uneven hardness. In the case of small parts, for which an entire heating and quenching cycle may be completed in a matter of a few seconds, the quench is not too critical; but in the case of large parts, for which quenches of several seconds are required, the quenching media should be applied in large volumes and at nominal pressures, as shown at the right, **M**, in Fig. 6.

When a multiturn coil is used with a spray quench ring—the assembly being arranged so that the spray passes through the coil spacings—the coil should be coated with a lacquer or an insulating-type of varnish. This coating is used to prevent arching between turns of

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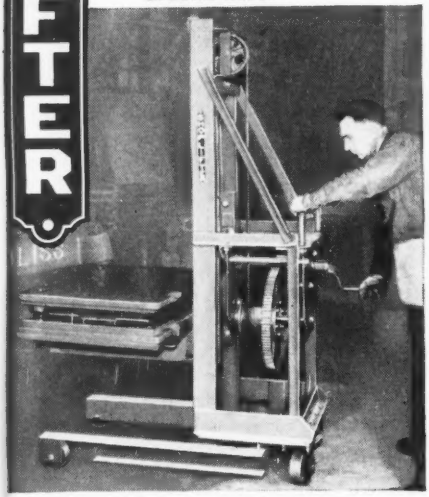

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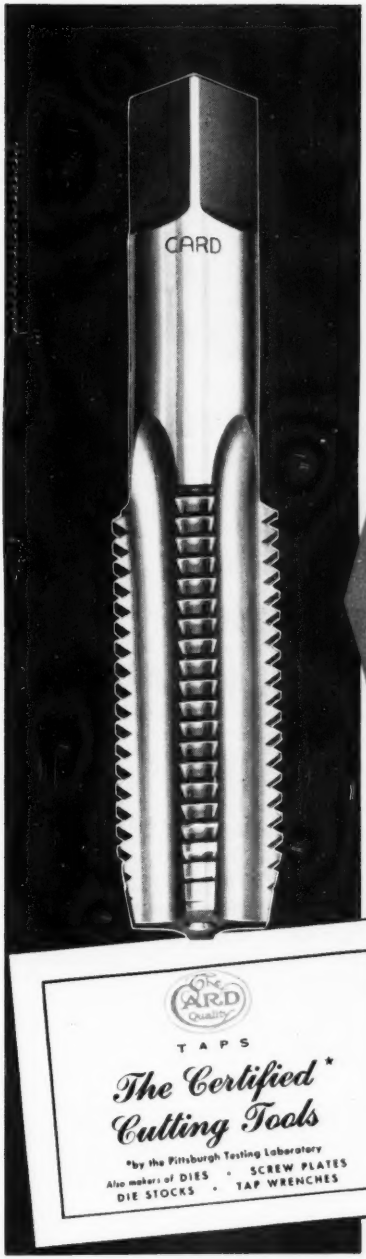
the coil, a possibility which might occur if a small amount of water were to remain lodged in the coil when it is re-energized. An insulating or silicone varnish, applied and baked in two or three coats, provides a suitable insulation of service. Coil-coating lacquers are also available for this purpose.

Normally, parts may be heated and quenched in one position, as shown at **N** in Fig. 7. However, movement of the work from the coil to a different position for quenching is sometimes advisable, especially if the coil is of such a design that there is interference in the proper distribution of the spray. An example of this interference in distribution may be seen in the single-turn coil sketched in Fig. 7 at **O**. In this case, the eccentric portion of the part is heated in the upper position; and, after being heated to the required temperature, it is lowered immediately to the quench zone. After quenching is completed, it is again elevated for removal. Such parts may also be raised from a coil to a quench area directly above, as at **P**, if it is more convenient. In either case, all of the times of the cycle are controlled automatically by means of a timer in order to assure proper, uniform results.

An example of an elevating fixture of the "pop-up" type is shown in Fig. 8. The work coil of this fixture is located below the quench ring. In operation, after a part has been loaded between centers, a push button is pressed; and the work is then lowered, by means of an air cylinder, into the coil for the required heating period. After heating, the part is raised by means of the air cylinder to the quenching zone; and when the quench has been completed, the operator removes the part by manually lifting the upper floating center. The cycle may then be repeated for another workpiece.

(Part II of this series will appear in the November issue)



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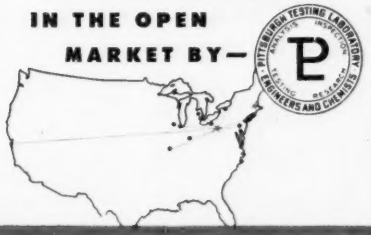

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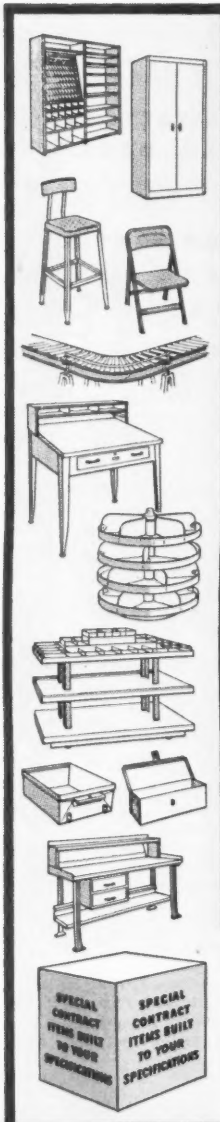

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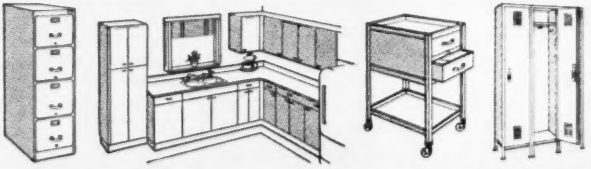

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C. W. Hinman

An Analysis of Blanking Die Designs, Part VII

The author describes special blanking and cutting dies, universal notching dies, the cutting of double rows of alternate blanks, and multiple perforating and blanking

By C. W. HINMAN
Designing Engineer

QUITE often it is possible to design and build special attachments for blanking dies which will enable the user to produce some types of work more efficiently. Figure 1 is a drawing of a semi-compound blanking die in which the cut blank is delivered to the surface of a shedder in the die block. In this die, use is made of a positively elevated stripper plate which, when the punch ascends after cutting into the work strip, provides for a generous amount of space over the die to allow for using compressed air to blow the blank off the shedder; or, if the press is tilted back, to allow the blank to slide away from the die by gravity.

If an elevated stripper plate were not used, the cut blank would clog the stop pin which is located underneath the strip, and seriously interfere with feeding. This method of stripping after

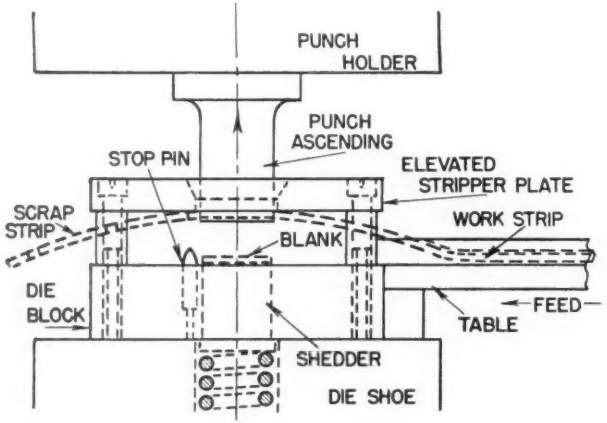

Fig. 1 — When cutting small blanks in a semi-compound die, the punch in ascent carries the work strip up to where it is positively "stripped off" against an elevated stripper plate. The cut blank remains on the shedder face, and is blown off by compressed air before the work strip drops on the die for cutting the next blank.

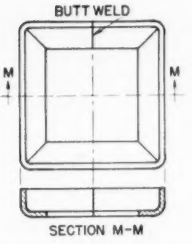

Fig. 2 — Drawing of square steel frame which is formed in a V-bending die.

blanking is similar to the "sky-hook" principle for stripping off formed work. The "sky-hook" principle will be illustrated and described later under an analysis of forming die designs.

If it is necessary to hold the work strip down on the die face while blanking, as in the case of cutting nonmetallic brittle strips, the stripper plate may be controlled by means of compression springs mounted above it. A stripper plate of this type is made so that it will slide up and down on four spring posts, one at each of its corners. The work clings to the punch in ascent, and is stripped from the punch when the plate contacts positive skyhooks or similar stops.

Figure 2 is a drawing of a square steel frame which is formed in a V-bending die and butt welded at its ends. This piece of work is a sample of commonly used parts, the blanks for which can be quickly cut in the universal notching die shown in Fig. 3. The work material is commercial angle iron which is tipped and fed along, after notching by punch **G**, to the point at which the cut notch is registered on V-block **I**. Stripper plate **H** clears the work, and is provided with slots that enable it to be adjusted to a position to suit the work. The stripper plate is positively locked in position by cap screws **K**. Guide plate **J** is also provided with adjustable slots for positioning

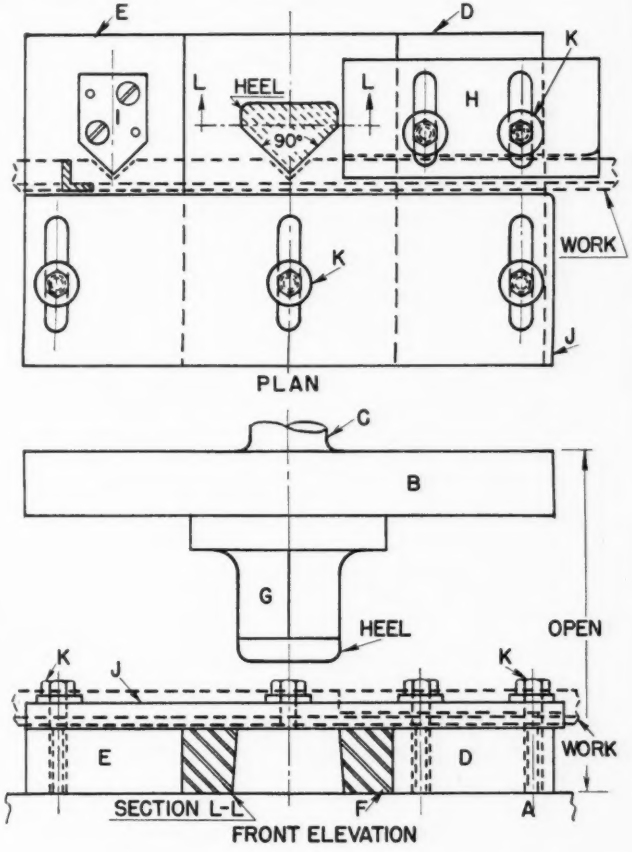

Fig. 3 — Design of a die for use in notching.

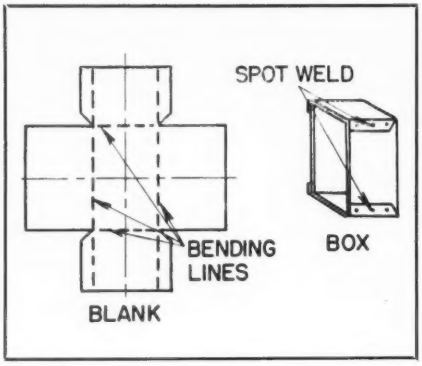

Fig. 4—Drawing of a notched blank that is used in forming a steel box.

and tightening to suit the work width. Die block **F** and punch **G** are tool steel hardened and ground, and blocks **D** and **E** are of machinery steel. The position of stop gauge **I** on the die block determines the lengths of the formed frames.

Cutting punch **G** is provided with a backup heel along its rear edge. This heel enters the die opening ahead of the cut and aligns the punch. It prevents punch deflection which would nick or shear cutting edges. Die block **F** and punch **G** can be removed and other shapes of cuts substituted. Thus, a variety of different shapes of cuts can be made. Figure 4 shows a drawing of a notched blank that is used in forming a steel box. At the right, the box blank is shown folded and with its flanged corners spot welded together.

A universal type notching die is an excellent tool for use in the small shop, and is of equally important value in large shops. It saves time and expense that without it, would be uselessly expended in designing and constructing expensive conventional dies for short run jobs. With two or more of these dies for cutting various shapes, it is possible to produce an endless variety of differently shaped blanks.

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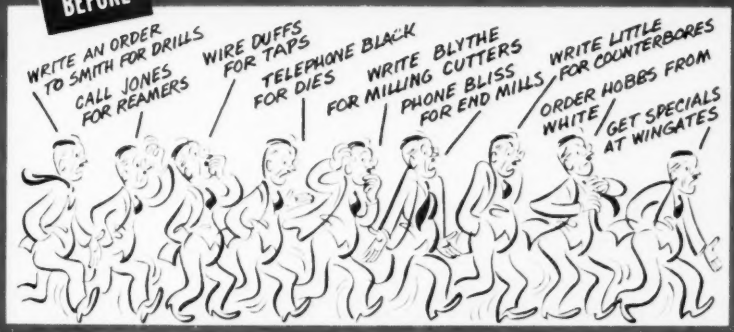
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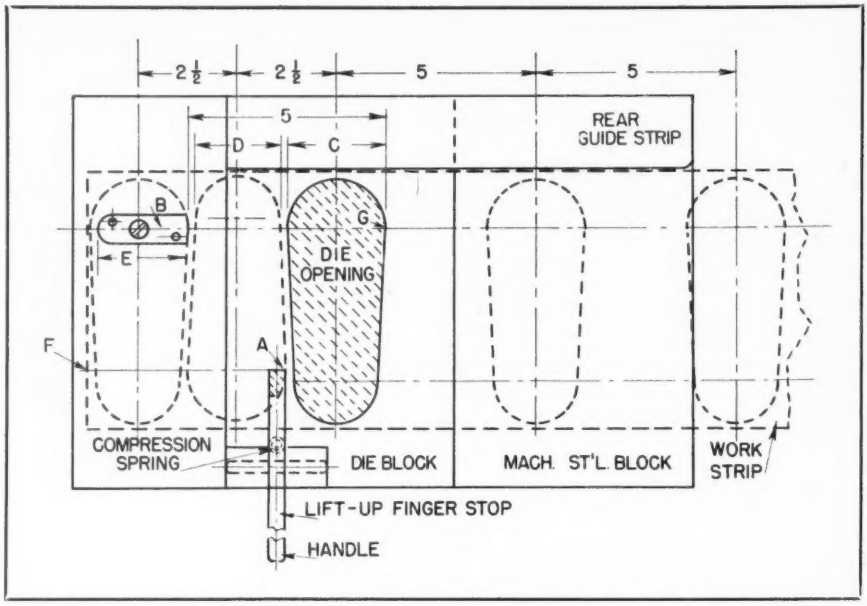

Fig. 5—Plan of die for cutting a double row of automobile bumper guard blanks.

Dies used for the same purposes are also made commercially. They consist of a rather elaborate machine design and do similar work on a large scale. These are called "turret punching machines" and perform cutting and forming operations at several individual stations which are arranged circularly at equally spaced stations.

Figure 5 shows a design of blanking die which is sometimes difficult to work out correctly. A designer who is not well established in die designing may not foresee all the difficulties involved here, unless he has previously solved similar problems. The major problem here is to arrange the proper stops for cutting two rows of large steel blanks. The sketch shows the die opening which has been section-lined for clarity, and the work strip in position to cut the first row of blanks. The first

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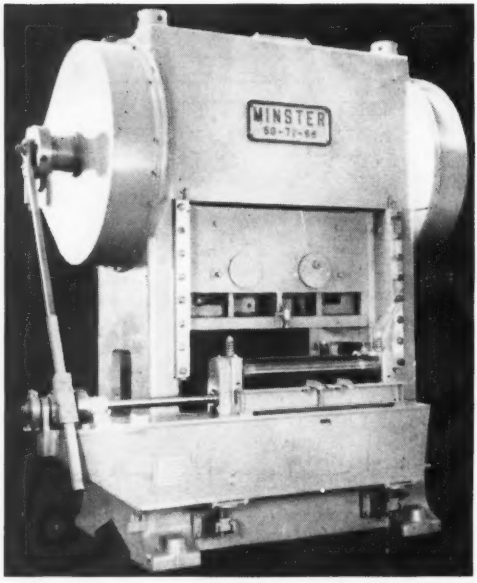

Fig. 6—View of press which is designed for perforating and blanking 84,000 laminations per hour.

and second row of blanks are not in "staggered positions" in the work strip as is usually the case, and herein lies the problem. The second row of blanks is cut from the alternate spaces remaining between the blanks after cutting the first row. In other words, the strip width is the same as would be used for blanking a conventional single row. The finger stop is normally elevated above the work strip by means of a compression spring located at point **A**. This finger stop is attached to the top surface of a channel stripper plate that covers the die blocks. When the stop handle is lifted, the forward end of the strip is contacted at **F**, by point **A** for cutting the first row. After the first blank is cut, the operator releases the finger stop, which is immediately elevated by the spring, and the first row is then run through the die.

Positive stop **B** is located to suit the blanking center distance which is 5 inches. The diameter of blanked opening **C** is greater than diameter **D**. Therefore, the length **E** of positive stop **B** is made greater than **D** but less than **C**. This feature facilitates running the second row of blanks after the workpiece has been turned over. The smaller openings **D** slide across the length **E** of the stop, and the right-hand edge within the larger openings **C** falls against the stop and registers the strip as desired.

Point **A** on the finger stop is located at the part of the die opening at a position where point **G**, in the second row, coincides with point **A**. Therefore,

Pictured: a 24-Spindle Heavy-Duty Drill Head.

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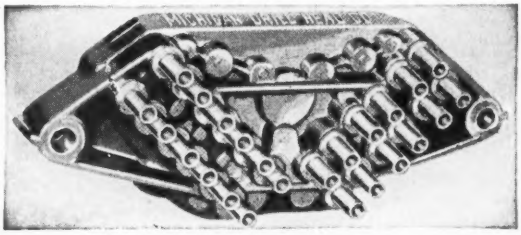

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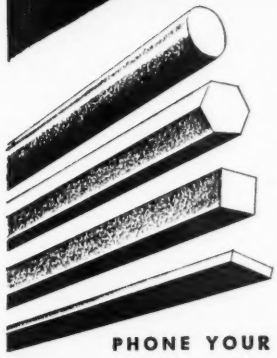

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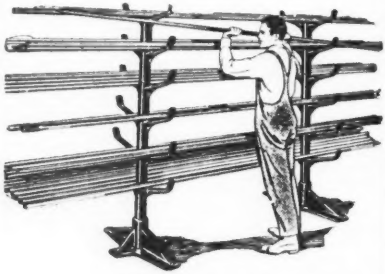

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when the strip is turned over to start the second row, **A** is caused to contact within the first blanked opening at point **G**, and the strip is then fed through the die in the manner just described for the first row.

Tapered blanks of these and similar shapes favor the use of both finger and positive stops of these designs. The double row of alternate blanks is necessary here in order to economize on work material.

Multiple Perforating and Blanking

Figure 6 illustrates a 250-ton straight side press equipped with an electronic clutch control that permits installing safety check stations for progressive die operations.

The feed consists of a single pair of knurled rolls, as shown in the foreground, and takes a silicon steel coiled sheet 42 inches wide. This front to rear feed is used with a two-step die that perforates and blanks rotor and stator laminations for fractional horsepower motors. The die is of multiple type and blanks 14 laminations per press stroke. Since the press operates at 100 strokes per minute, the surprising output of 1,400 blanks per minute, or a gross output of 84,000 per hour is obtained.

"Ampco Welding News." Issue No. 41 of "Ampco Welding News," publication of Ampco Metal, Inc., Dept. WN, Milwaukee 15, Wis., features an article explaining how $4,800.00 were saved by repairing a turbine runner with Ampco-Trode electrodes. Another article tells of the methods employed in salvaging a large cast iron gear housing with Ampco-Trode. Several other interesting case histories are also included in the issue.

Spiral Fluted Taps, available in hand and machine screw types with right-hand spiral flutes for cutting threads in aluminum, magnesium, brass, copper, zinc, and similar materials, are illustrated, described, and listed in a four-page two-color folder issued by the Union Twist Drill Co., Butterfield Division, Derby Line, Vermont.

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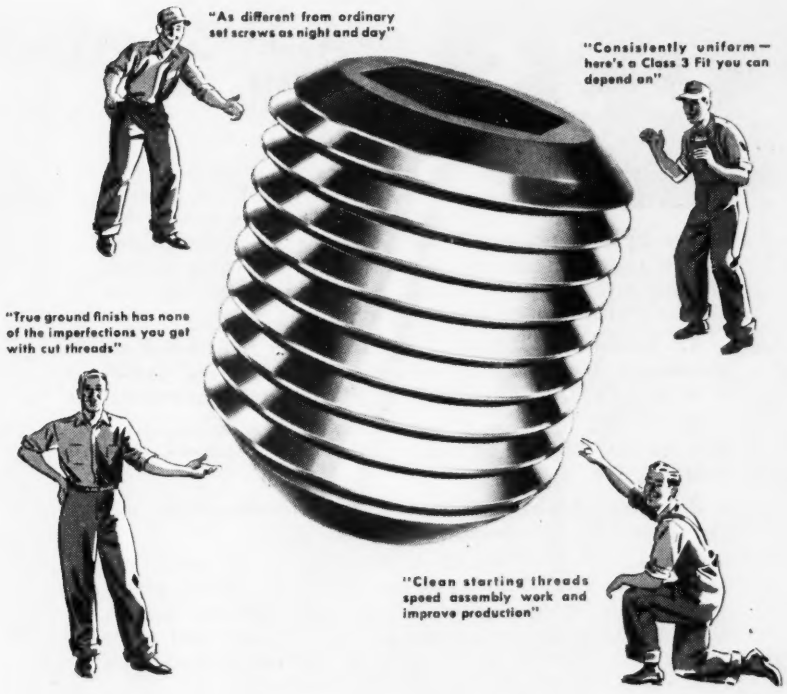
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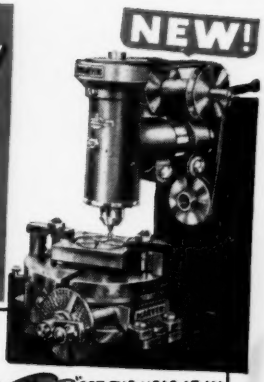

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By F. J. KOEGLER
Executive Vice President
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ALMOST everyone is familiar with the adage that tells us no man is indispensable. Out of your own experience, you could undoubtedly gather convincing evidence either to support or combat that thesis. You know of instances where the loss of a key executive has ushered in a period of declining production, sales or profits. Or you can recall the case where a supposedly indispensable man walked out, and his oversize boots were promptly filled by a subordinate who carried on as if he had been "to the manor born".

If these conflicting stories cast doubt on the theory of indispensability, that doubt can be readily resolved. Just ask yourself what chance a stormbattered ocean liner would have to make port safely if the captain were suddenly stricken with appendicitis and there was no other officer aboard who was ready, willing and **able** to take over. How much would you wager on the pennant winning possibilities of a baseball team that counted on a single pitcher? What would you think of a Broadway production that provided no understudy against the event that the featured player might have a bellyache or a temperamental tantrum? And how would you rate an army that had no corporals to pinch hit for a disabled sergeant, or for that matter, no colonel big enough to wear a general's star with credit?

These questions answer themselves. They back up the adage that no man is really indispensable, provided another who possesses the same potentials is standing by. Few business executives would quarrel with the soundness of that logic, yet time and again situations crop up where management is confronted with the need to replace key men almost without warning.

The unexpected death of one of our division superintendents posed such a problem in our organization. Fortunately for us, an experienced man was ready to take over. But while his prior training as assistant division superintendent qualified him for the vacancy, moving him up from the important labor relations slot he was currently filling might have created another troublesome hole. Here again, we had the right man in reserve, without going into a huddle to compare notes about possible candidates and the need for a "horseback" decision.

If this successful "double play" were

just a "happenstance" is would hardly be worth recording. The point is that we were prepared to make the right replacements in both jobs simultaneously because we had put in some hard licks at building an executive second line of defense. This wisdom was not heaven sent. It was a product of the school of hard knocks, and was preceded by its full quota of trial and error.

Like many other organizations, we had committees to appraise the younger men who looked like good bets for training and promotion to our supervisory staff. We defined our jobs according to the best scientific methods of analysis and evaluation. We concentrated on improving and perfecting our interviewing procedures. We made thorough investigations of every applicant's work history. We watched the men in action in our plants.

These safeguards helped. They reduced the margin of error, but they still left much to be desired. Too often, our considered judgment fell short of the mark, and men who were stepped up proceeded to fall down for reasons we had not previously been able to predict.

Something about an individual's nature would arise to cancel out his usefulness as a supervisor. Another's failure to check his decisions before issuing authorization nullified his seemingly exceptional training and experience. His mistakes were costly and disruptive. On more than one occasion, the faulty judgment of otherwise dependable men made us regret the placements we had made. Someone has said that being right in the stock market three times out of five insured a profitable operation. That batting average is not acceptable in the business world where the need for consistently sound policy decisions is imperative.

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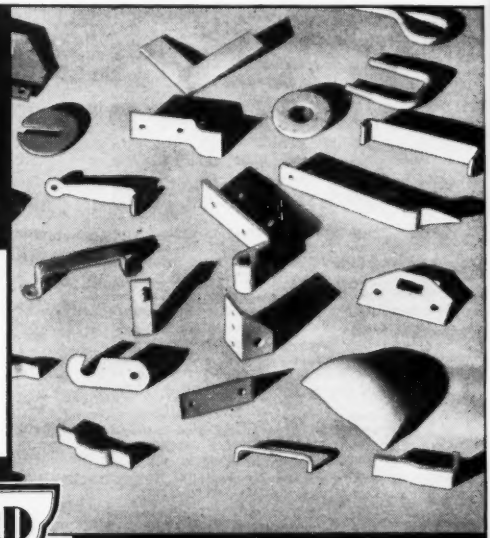

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advancing men from within the organization, as long as we can do so without the in-breeding that leads to complacency and inertia. When openings occurred in time study, engineering, payroll, labor relations, and so on, we earmarked these opportunities for men who were eager to transfer from other departments. Here we discovered that the wish is indeed often father to the thought, but wish fulfillment did not always bring with it satisfactory **work fulfillment.**

These p e r i o d i c disappointments made us realize that we would have to arrive at a more scientific and dependable method of manpower and brainpower evaluation. We felt confident that we had an ample reservoir of untapped abilities within our ranks. The problem was how best to locate those budding talents, and by the same token, how best to avoid picking duds.

Machines have been devised that can detect the most infinitesimal flaws in steel girders, but we know of no gadget that can probe those human quirks that only come to the surface under pressure. We decided that the next best thing would be to make use of the visiting psychologists who interviewed our men on the premises, told us what their motivations were and how they could handle specific kinds of responsibilities. It was a long step forward. We learned some things about men which went beyond our own limited observations. But the system was cumbersome. The psychologist had to be on tap just when the men could be released and this was frequently inconvenient.

In casting about for a more flexible program, we became aware of a psychological testing procedure that overcame our previous objections. The organization* agreed to provide suitable tests and taught us how to administer them correctly. Our only other obligation was to provide a full description of what each man was called upon to

* *Executive Analysis Corporation.*

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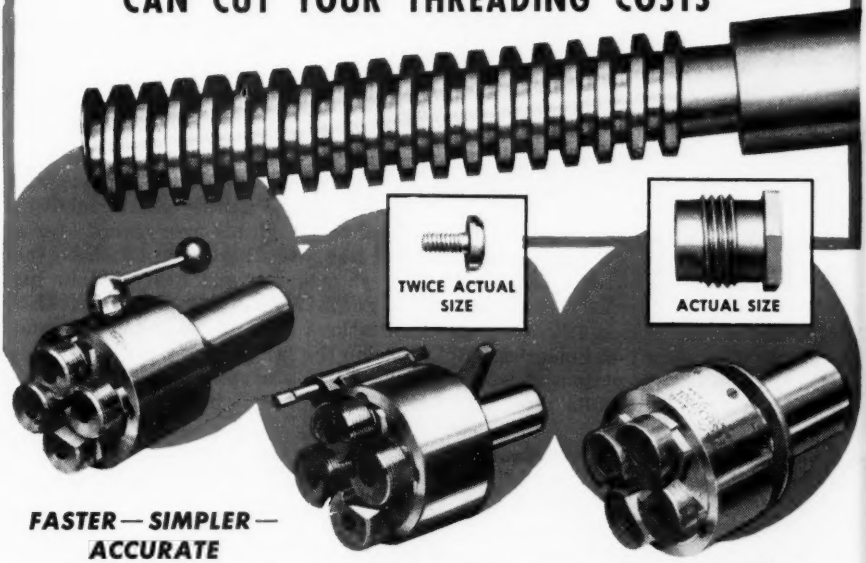

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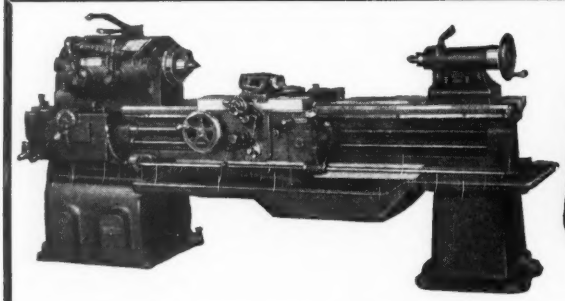
do. This was simple enough, since the data prepared for our job evaluation program answered the purpose quite adequately. We then turned the completed tests over to the psychologists for appraisals.

How has it worked? Surprisingly well, or there would be no point to this story. We could judge a man's past achievement with us. **Their** job was to predict how he would act to meet the responsibilities of a new job. The useful thing to us was that they could and did accomplish this without the need for seeing the man being analyzed.

Here are a few instances where they flashed a warning red light to keep us from trying to fit a square peg into a round hole. Analysis of a certain individual under consideration for time-study work noted that he "bends over backwards to please people". Now, as you know, time-study engineering requires the ability to explain and defend competent studies. It calls for backbone. Checking our own observations, we realized that the report was right. The man in question could be a valuable asset, but not in the category we had earmarked for him.

Another employee was revealed as too prone to indulge in criticism and fault-finding. Not too sure of the "ceiling" which one meticulous and thoroughly honest man could reach, it helped us to have detailed reasons why he could supervise at the level of a first line supervisor but lacked what it takes for policy making. Again, we raised our eyebrows when the report on a certain individual explained the puzzle of poor morale of his subordinates. Although his own record over a period of years had been excellent, he had shown only his best side to his superiors. Now we can evaluate his limitations as well as his assets and develop the latter more realistically.

Another important phase of the service consists of highlighting the poten-



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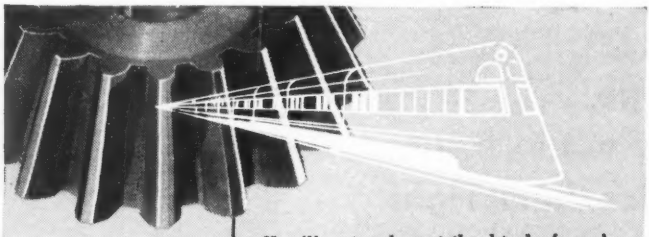
tials and shortcomings among men on the floor and on the bench. Several of the men tested by them have been advanced to assistant foremanships or similar supervisory jobs. These men are developing splendidly because the combined information from our own observations plus the psychological reports enable us to handle them more intelligently. Incidentally, the hole in the labor relations department previously mentioned, was ably filled by one of our younger employees whose analysis pointed up a latent capacity for meeting just such responsibilities.

It has also been a source of real satisfaction to discover two or three men in their early thirties who have potentials for executive leadership. We know from their psychological evaluation that in working to develop them for top level assignments, we are building on solid ground. That knowledge, backed by the overwhelming accuracy of the more than one hundred fifty reports we have received thus far, is highly comforting. For us, it is insurance against the challenge of the future; for our people it is a morale booster.

To conclude this story without reference to the economy factor would be to serve up a sundae without whipped cream. Down-the-drain training cost is the bugaboo of supervisory selection, and we found a practical measure of what our "insurance" could save us. Our first report was on a man whose history with us was not revealed to the psychologists. They did not interview him



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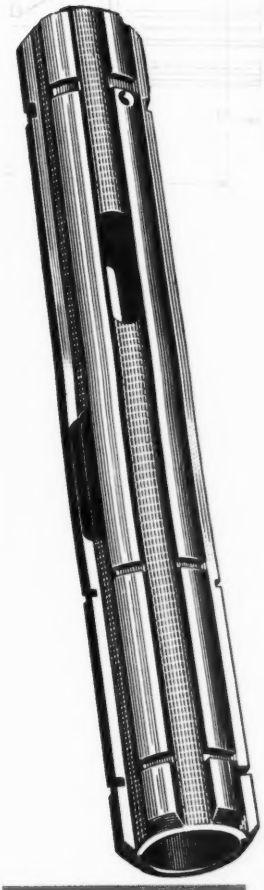

the tube that helps pay for itself

IT takes 20 operations—from broaching to final milling—to make this tubular spline shaft. Cost of this machining sequence makes the finished shaft a stiff rejection risk . . . only quality seamless tubing can be used for the job. The tubing used in this particular instance, however, helps pay for itself in the bargain.

This dividend stems from a spec change, a new analysis recently adopted by the manufacturer on Frasse recommendation. Costing 10% extra, this tubing, through better machinability, *more* than earns back its slight additional cost.

Elapsed time of the cut-off operation, for instance, has been reduced from 1.03 to .948 minutes. Rough turning once took 3.0 minutes—now requires but 1.72. Broaching is now accomplished in one pass instead of the previous two. And 6.77 minutes of hobbing operation have been cut to 5.72—*with 30% longer tool life*, by the manufacturer's own estimate.

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yet their report described his characteristic behavior on the job precisely. Although well trained, ample tryout proved that he was a man who could not carry responsibility. **We know now that this could have been predicted before he was assigned to his job.** The savings? We have secured the hundred-and-fifty evaluations for what we spent in salary on one man who failed to work out.

Napoleon once said that "there is a marshal's baton in every corporal's knapsack". The trick is in singling out the corporal. We believe that we have found a more effective and scientific way of preparing a strong second line of executive defense through recourse to this use of psychological testing.

G-E Engineers Develop Piercing and Blanking Operations Using Liquid Impact Method

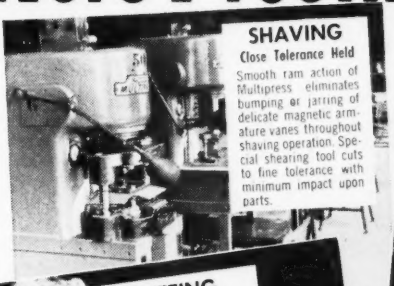
AN investigation conducted to determine the practicability of using a liquid instead of metal punches to produce blanks from silicon sheet steel has been concluded with successful results by engineers of General Electric's Works Laboratory, Schenectady, New York.

As opposed to the ordinary methods of using a metal punch and die, this method substitutes a column of oil for the punch. The oil can be effectively channeled back and reused, eliminating the use of metal punches which are worn out rapidly on silicon sheet steel.

It is possible through the method to use soft, unhardened steel dies which cannot be done with the conventional metal punch. The engineers have determined that for each particular size and thickness of steel, it is necessary to calculate the particular impulse force to achieve a satisfactory blank.

The development of this method, while still in an experimental stage, has indicated that satisfactory blanks can be made.

More Proof...



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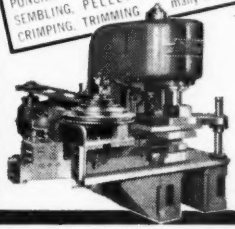

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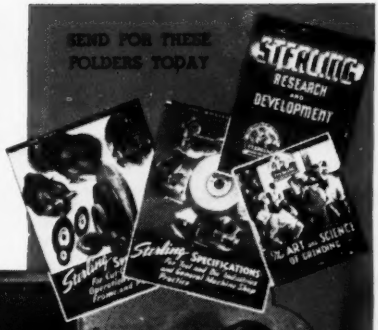

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Karl F. Kirchhofer

Sales Hints for the Smaller Shop, Part III

It's Cheaper With Experts

By Karl F. Kirchhofer

ONE day while making a tour through a local machine shop, I was confronted by an irate, upset individual. The shop man glared at me. "Why do they quote on work for which we're not fitted? Look at this rack. Sure I can make it; in fact, I can make it in any one of a number of ways, but you ought to see the price that was quoted for this job. We'll lose money on it." I looked at the print. It was a simple enough rack designed to be built into a complete mechanism on which the shop had quoted. There were also a number of gears to be cut.

I suggested, "Well, if I were you, I wouldn't worry about this job. Send it to a reliable gear manufacturer. Of course I know that you can make your own gears, but a gear manufacturer is a specialist. He has all types of special equipment. He can do the job much less expensively than you can even with his profit, because he's equipped properly and he's an expert in his line. I've found out that it's cheaper in the long run to go to specialists."

There are many case histories that prove this point. With certain basic machine tools and accessories there is no doubt that many machine shops can produce virtually anything of metal—but at what cost. In the course of my travels about the country, I called on the chief inspector of a large internationally-known organization. During my demonstration of a newly developed tester, he exclaimed, "Why that's almost a duplicate of ours. We built five of these for our use. Only you've got a couple of improvements that we'd like to incorporate in ours. What's the price of your tester?"

When I told him the price, he gasped, "Why ours cost us almost three times that amount to make, counting our high overhead. Why didn't we know yours was available?"

I shook my head. "Just one of those things. It's been widely advertised, but this is the first opportunity I've had to come up and show it." It was natural that we could manufacture and afford to sell the tester at less than half the cost to the huge manufacturer making his own. In addition to their big overhead, they produced only five gear testers. Each one was virtually a hand-

tooled job. We, on the other hand, had developed jigs and fixtures, had tooled up to produce hundreds of testers. Moral . . . if your shop is in need of inspection, checking or testing devices, it is hardly worthwhile to build it yourself. See a specialist in precision instruments. See a recognized manufacturer of tools and gages. The chances are that he has gone through all the creative pains, has already solved the problems you are sure to confront in your work of developing the device.

The same is true of many other types of work, especially in the production of various parts—components that you plan to build into your product. Let's say for example, that you need a variety of long, thin, extremely accurate pivots. Instead of turning these down on your own lathes and then going to a new set-up on second purpose machines, it may be far less expensive to farm out the job to a specialist, a shop equipped with Swiss-type automatics which can do the job much faster and probably more accurately than the plant that does not have these machines.

There's another excellent reason for farming out work to specialists. You relieve your own plant and superintendent of special difficulties that arise in production, due to the fact that your shop may not have the centerless grinding machines, the gear generators, the screw machines, or the turret lathes that enable the specialist, the expert, to turn out the work faster, better and more economically.

Then, again, you take no chances of spoiling the job at some stage of production. The specialist must deliver according to your prints and if he doesn't, if the work fails to fall within the tolerances required, you don't have to accept it. The sub-contractor assumes this burden. There are few plants that are so universally equipped that they cannot occasionally use the services of a specialist. Even the

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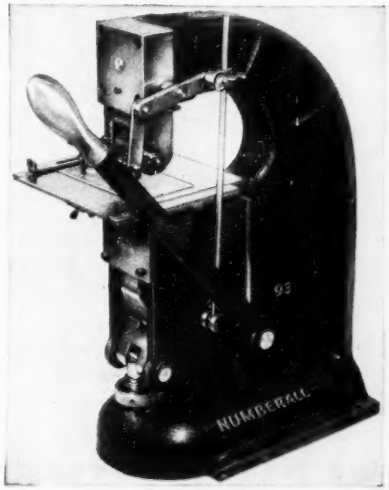

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world's great electric and business machine organizations frequently farm out tool and die work to smaller shops, not because the big outfits are unable to do the work themselves, but because the little fellow, the small tool and die shop, can often do the work cheaper.

Recently, I ran across a small machine shop away out in the country with four employees that was turning out work to tolerances that the big aircraft plant for which they were working couldn't hold. In a converted barn, there was a man, an expert, grinding threads for a plant that has become a household word, not only in metalworking circles but in the average home.

Toolmakers and machinists often try to make their own hand tools. While this may save the individual a few dollars, it can be very expensive to the company, particularly, when the tools are made on the boss's time. Take sine bars for example. I have come across any number of toolmakers who, upon seeing sine bars advertised in a catalog, will remark. "I made up my own during spare time." Actually it is spare time that has been taken away from the employer and investigation may reveal startling figures as to the real cost of the sine bar. It's wiser and cheaper in the long run to go to specialists, to people who tool up and make sine bars in hundred lots, rather than to endeavor to make one yourself.

The next time, therefore, that you are figuring on a job, considering the manufacture of a testing device, it will pay you to investigate the possibilities of farming it out, of going to the precision manufacturer. Give the specialist a chance to quote and you may be surprised at how much you may reduce your costs.

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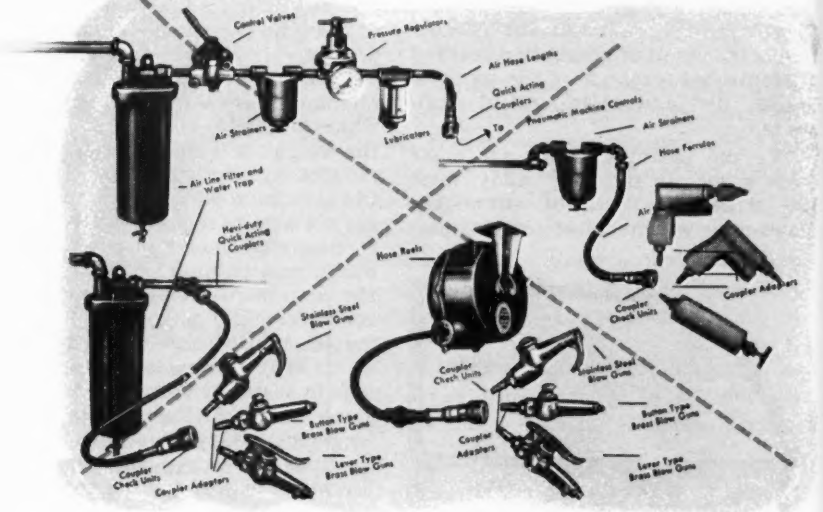

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Die-Cast Aluminum Automobile Door Frames

WHAT are said to be the largest die castings in area ever produced are now in production in the form of aluminum automobile door frames at the Doehler-Jarvis Corp. in New York City. The development of the die-cast door frame, which was designed cooperatively by Doehler engineers and those of Kaiser-Frazer of Willow Run, Michigan, may very weil show far-reaching effects in the future design and manufacturing costs of automobiles. The current production is the result of nearly two years of concentrated research on the parts of design, die, and metallurgical engineers.

The die castings, which are made from a special aluminum alloy, form the structural bases of automobile doors, to which sheet steel outer panels are attached. The overall dimensional area of a casting, such as the one shown in Fig. 1, is approximately 1200 square inches; and the weight is slightly more than 12 lb. when trimmed. Shown in Fig. 2 is the die used in the frame production which weighs approximately 13 tons; the trimming die weighs more than four tons. The molten aluminum alloy which is used for the frames is "shot" into the steel die in less than one-fifth of a second. The production rate is approximately 30 frames per hour.

There are many advantages to using aluminum die-cast door frames, one of which is weight; by using such frames, the weight of a four-door car may be reduced by approximately 35 lb. With the aluminum die castings, the designers are able to make freer use of reinforcing ribs than was possible previously; and because of the rigidity of the aluminum frames, the "tin-like" sound formerly noticed has been eliminated. Also, because of the uniformity of die cast frames, a substantial savings in assembly costs may be realized since "hand fitting" of doors is no longer necessary. Due to the inherent qualities of the special aluminum alloy which is used for the frames, they are provided with not only light weight but also with corrosion resistance without special treatment; and they are said to be free from dimen-

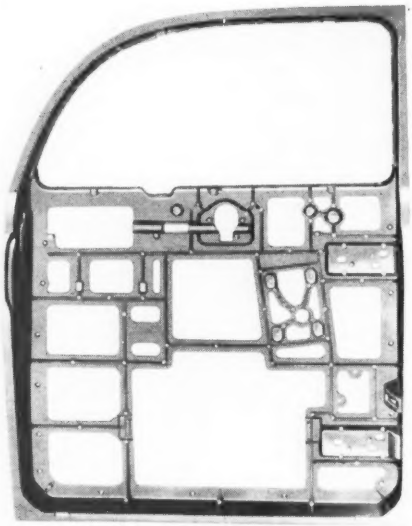

Fig. 1—Aluminum die-cast automobile frame having an area of approximately 1200 square inches.

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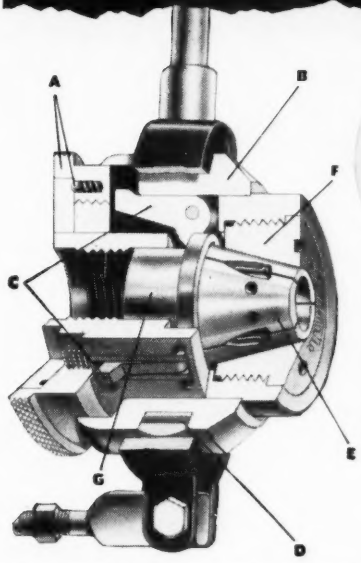
with the

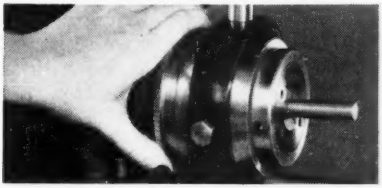
Levermatic COLLET CHUCK



CONSTRUCTION FEATURES

- **A — Pressure adjusting ring with ball detent lock**
- **B — Positive cam closing collar**
- **C — Hardened cam levers (three)**
- **D — Self-lubricating bronze yoke shoe**
- **E — Parallel grip design collet**
- **F — Precision ground closing ring**
- **G — Collet pusher sleeve**

Instant adjustment of ring for any collet pressure



One customer solved a serious holding problem on a 4-station hobbing machine by using Levermatics. Formerly the carbide-tipped centers holding the work were breaking much too frequently — though the shaft being cut was supported by a follower-rest. Levermatics now grip the work positively, assuring greater accuracy and uninterrupted production. Another Levermatic operator cut machine rates from 44½c to 22½c per 100 pieces.

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Fig. 2 — 13-ton steel die used in the production of aluminum door frames.

sional changes and, in addition, retain all original properties at subnormal temperatures.

Cathodic Vacuum Etching Applied To Metal Surface Examination

A REVOLUTIONARY new etching process to prepare metal surfaces for microscopic examination and photography has been developed by the Ford Motor Company. The unique metal-etching method—never before used in industry—utilizes ionized atoms. The process is known as cathodic vacuum etching.

Etching is widely used in industry to examine metal structures for determining quality and aiding in development of new materials or manufacturing processes. However, cathodic vacuum etching has brought an important improvement. It enables the taking of an unusually clear photograph of flow lines—a curious strata-like pattern which indicates the direction the metal flowed when forged under high pressure.

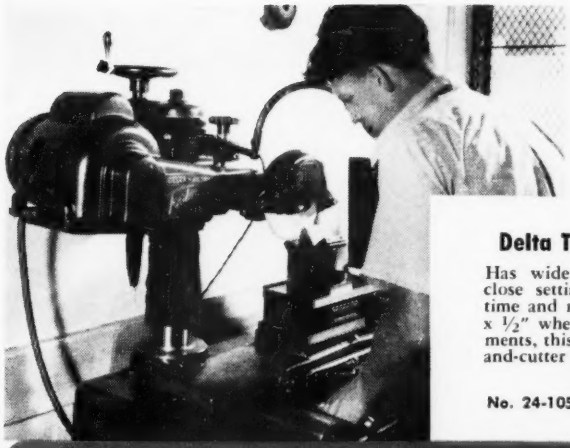
The new etching technique works this way: The metal sample is placed in a partial vacuum with argon, a rare gas found in the air. Twelve thousand volts of electricity are charged into the vacuum, creating argon ions which bombard the metal surface and knock off minute particles.

Under the newly developed method the physical features of metal can be examined under a microscope and measured accurately as to their effect on strength and performance in whatever part of the Ford cars the metal ultimately will become a fixture.

Flow lines in steel samples previously undetected now have been revealed by cathodic bombardment. Comparison of the structure pattern produced by the best chemical etching method revealed that the new cathodic treatment brings out the true microstructure of the metal with greater detail and clarity.

A special pressure-rolled Ford front wheel spindle was examined experimentally by the usual microscopic technique. No superficial layer of flowed metal could be detected by the chemical etching process. However, cathodic bombardment etching revealed the entire superficially rolled structure, showing individual flow lines which indicated that deformation was only 0.005-inch deep.

Results also were obtained which indicate that grain structure of metals



DELTA
MILWAUKEE
®

Delta Toolmaker Surface Grinder**

Has wide graduations on micrometer, for close settings. Unique wheel adapter saves time and redressing. Many other features. 7" x ½" wheel, 1¼" bore. With simple attachments, this machine becomes an efficient tool-and-cutter grinder or a chipbreaker grinder.

No. 24-105 $375* without wheel, motor, or switch

These DELTA® machines cut grinding costs for toolroom and production work

Delta Grinder with Twin-Lite Safety Shields**—Twin-Lite Safety Shields act as "built-in goggles," flooding your work with light. Fully-machined tool rests. Balanced wheels. Lubricated-for-life ball bearings. **No. 23-405** — Complete with safety shields, lamp bulbs, wheel guards, and wheels. - - **$114***

Delta Carbide Tool Grinder—Combined with Delta's standard tool grinder for hogging down the shank steel, this machine gives you a perfect working combination for sharpening tungsten carbide tools. **No. 23-555**—Complete with lamp attachment, water pot, and wheels - **$154***

*Prices subject to change without notice.

**Trade Mark Reg. U. S. Pat. Off.

Delta grinders are available in both bench and floor models — with current and speeds to suit any requirement. Simple, easily-adjusted attachments increase the utility of these machines.

Your nearby Delta distributor has these popular grinders on display now. Inspect them there. Ask about buying on easy credit terms. Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory — call him today.

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Rockwell Manufacturing Co.
Milwaukee 1, Wisconsin

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Name.....

Title.....

Company.....

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City.....(.....) State.....

M-36A

Illustration showing a metal sample being tested by Don M. McCutcheon, of the Ford Motor Company's applied physics research department. The metal is placed in a partial vacuum containing argon. A charge of 12,000 volts of electricity is sent into the vacuum. This creates argon ions which bombard the surface of the metal, knocking off minute particles and bringing out the true microstructure of the metal with greater detail and clarity than that obtained with previously used methods.

also can be more clearly shown by cathodic bombardment. Ford engineers have begun an extensive program to explore this phase of cathodic etching. Photographs illustrating cathodic etched structures have been awarded first prize by the American Society for Metals.

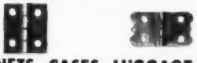
Universal Hydraulic Grinder, designed to perform practically all internal and external grinding jobs encountered in the average toolroom, is described in a 13-page bulletin published by Rivett Lathe & Grinder, Inc., Brighton 34 (Boston), Mass. Large illustrations with descriptions cover construction features of the grinder and types of jobs it will perform.

Precision Boring and Milling Machine, known as the "Jigmil" and adaptable for production, tool, and experimental work, is fully illustrated and described as to construction features, available models, specifications, accessories, and so on, in a 20-page two-color catalog published by the DeVlieg Machine Co., 450 Fair Ave., Ferndale 20, Detroit, Michigan.

OPEN THE WAY TO GREATER PROFITS

BUTTS AND CONTINUOUS LENGTHS

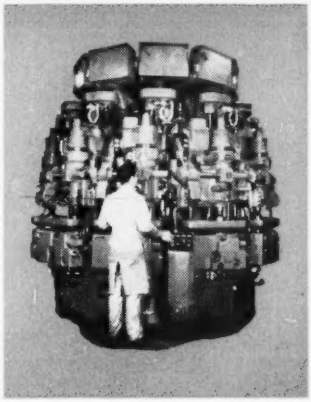
S&S



FOR CABINETS, CASES, LUGGAGE, GUARDS, ETC.

S & S HINGE AND METAL PRODUCTS CO.

4725-35 IOWA ST. DEPT. M. CHICAGO 51, ILL.



"Our shop had a series of costly shut-downs because our circulating oils were foaming and oxidizing, causing sludge formation and corrosion damage to our equipment.

"A Cities Service Lubrication Engineer suggested we change to a Cities Service Pacemaker 'T' multi-purpose oil, fortified against foaming, oxidation and rusting.

"Shut-downs were immediately reduced by 200%. Line efficiency improved and quality of production was substantially stepped up."

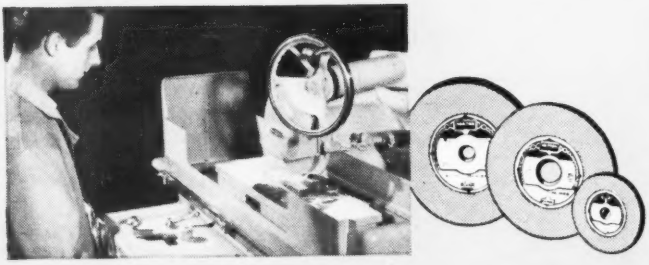
CITIES SERVICE PACEMAKER "T" MULTI-PURPOSE OILS

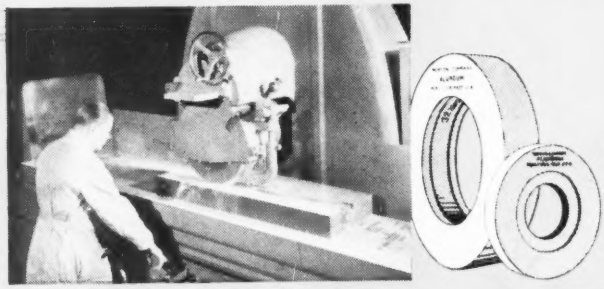
- ★ For Hydraulic Systems
- ★ For Air Compressors
- ★ Circulating Systems

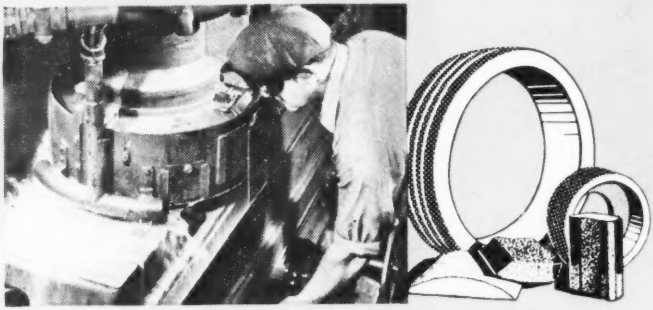
Free—If you use cutting oils, write for our booklet "Metal Cutting Fluids." Write Cities Service Oil Company, Room 494, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

Looking for Lower







Abrasives · Grinding Wheels · Grinding and Lapping Machines · Refractories · Porous Mediums · Non-slip Floors · Norbide Products · Labeling Machines

Surface Grinding Costs?

Here's Real Help—

NORTON PRODUCT VARIETY TO MEET *EVERY* JOB REQUIREMENT

Straight wheels for the light tool room grinder or the big production job, cylinder and cup wheels in all sizes and including the plate mounted type, segments in sizes and shapes for all makes of chucks . . . a wide variety of abrasives including ALUNDUM, 38 ALUNDUM, 57 ALUNDUM, the unique 32 ALUNDUM and CRYSTOLON abrasives . . . several bonds including vitrified, BE vitrified, silicate and resinoid.

NORTON ENGINEERING "KNOW-HOW" TO SOLVE *EVERY* SURFACING PROBLEM

It's not enough to have the right wheel or segment for each surfacing job. Lowest cost can only come when they are properly selected for the job. And that's where Norton "know-how" is important. In every industrial center there are Norton abrasive engineers—each an expert in selecting the right product for your surfacing jobs. At Worcester there are engineering and laboratory specialists. Throughout the country there are over two thousand Norton distributor men—a large percentage of them factory-trained at Worcester.

Take advantage of the completeness of the Norton line and Norton engineering "know-how" to get all your surface grinding costs down to meet today's keen competition.

A Sensation for Surface Grinding . . .
32 ALUNDUM

Exclusively Norton, 32 ALUNDUM wheels cut faster and cooler, last longer and require fewer dressings. Have you tried them?

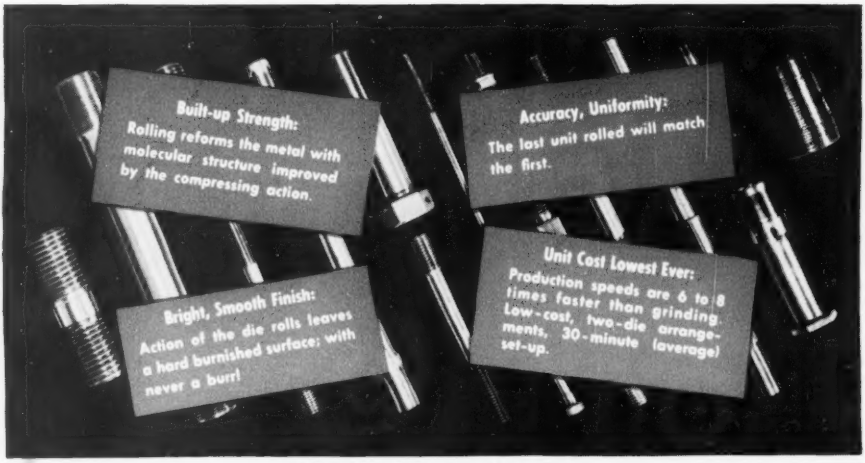
NORTON ABRASIVES

W-1259A

NORTON COMPANY, WORCESTER, MASS. New York Chicago Detroit Cleveland Philadelphia Pittsburgh Hartford St. Louis Los Angeles

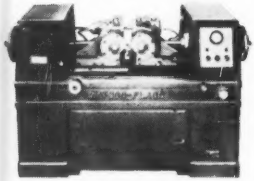
PRECISION ROLLING OF THREADS UP TO CLASS 4?

This *Widely-Varied* Work has *Uniform* Characteristics


Built-up Strength:
Rolling reforms the metal with molecular structure improved by the compressing action.
Accuracy, Uniformity:
The last unit rolled will match the first.
Bright, Smooth Finish:
Action of the die rolls leaves a hard burnished surface; with never a burr!
Unit Cost Lowest Ever:
Production speeds are 6 to 8 times faster than grinding. Low-cost, two-die arrangements, 30-minute (average) set-up.

Sound too good to be true?

Prove it by a TRIAL QUANTITY— here's how



Ask Watson-Flagg for an estimate on a trial production quantity of any precision thread work you require, you to judge the result for accuracy, uniformity, strength, finish and low unit cost. Send samples or specifications to our Engineering Department.

The Watson-Flagg Precision Thread Roller has ample strength for high pressures. Its work range — threading, serrating, burnishing, knurling — is accomplished with a two die set-up. Dies are 6" diameter and have the long rolling life inherent in large dies.

Take advantage of this "trial quantity" offer. See for yourself why many firms have found the Watson-Flagg Precision Thread Roller profitable to own.

Precision Thread Roller

WATSON-FLAGG MACHINE COMPANY

822 East 25th St., PATERSON 3, NEW JERSEY

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CLUTCH SPEED COUNTER

Quickly and accurately measures the R.P.M. of shafts or other revolving parts. A necessity for keeping motors, generators, shafting and machines, operating at efficient speeds. To use, simply press against revolving object and time one minute, using any watch with a second hand. The counter will then show the exact R.P.M. The Veeder-Root spring clutch allows the operator's attention to be given to the watch instead of the counter . . . eliminates need for a stop watch in speed checking. The unit is never affected by magnetism. If not available at your supply house, order direct using coupon below.

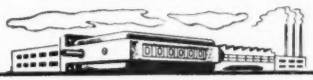
HAND TALLY COUNTER

Counts anything you can see!

Useful for checking machine production, equipment, stock, idle machines, attendance, in fact, anything that needs counting. Easily returned to zero by turning the reset knob.

Veeder-Root

The Counting Hones of Industry



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Please send the following: ....

- ☐ Literature on Clutch Speed Counter
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- ☐ Quantity.....Veeder-Root Clutch Speed Counters @ $5.50 each
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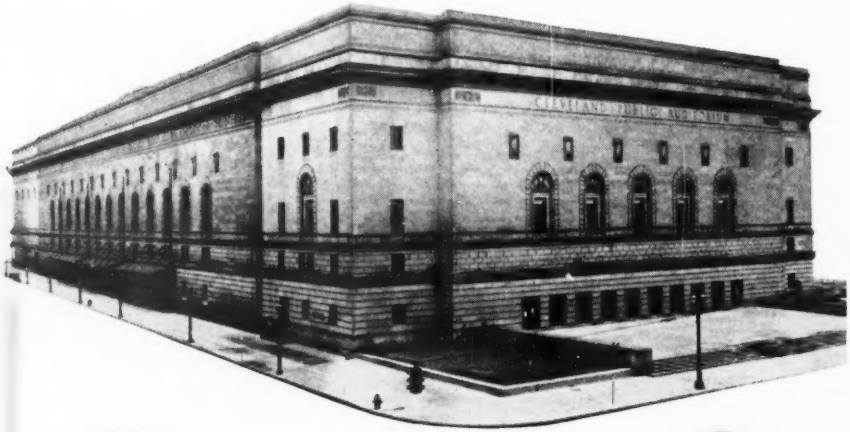
COMPANY.....

STREET.....CITY.....STATE.....

NAME.....



31st National Metal Congress and Exposition

CLEVELAND will be the 1949 host to the four participating societies who will cooperate in presenting the 31st Annual Metal Congress and Exposition which is to be held in the city October 17 to 21, inclusive. The four societies are the American Society for Metals, American Welding Society, Metals Branch, American Institute of Mining and Metallurgical Engineers, and the Society for Non-Destructive Testing.

The primary purpose of an Annual Metal Congress and Exposition is to bring together the experience, the knowledge and the means for producing and fabricating metals to the end that the best of all these will be more widely known and understood, that the exchange of ideas and the demonstration of equipment will enable the metals industry as a whole to progress and support the needs for better metals, more economical methods and greater usefulness for products made of metals.

Economy in Production

Special emphasis in the educational sessions and exhibits will be placed on this year's central theme—Economy in Production. This theme is designed to focus attention on the greater efficiency of modern industrial equipment by actual demonstration of what equipment will do to effect savings and thus reduce the unit cost of the product or part it helps to make.

Dramatic principles of cost cutting will take the form of "know-how" during the special technical and educational sessions of the Metal Congress; the "show-how" of production economy will be graphically demonstrated by the exhibitors who, with either materials, equipment or processes, will illustrate the proper application and most efficient operation of their product as a contribution to savings in production.

Approximately 350 nationally known firms engaged in either the production of metals, the treatment of metals, their fabrication, or in rendering services to all of these, will exhibit their products, equipment or services in Cleveland's huge Public Auditorium. Over 200,000 square feet of floor space has been assigned to the hundreds of companies who will participate in the five-day Metal Exposition. Many additional smaller auditoriums, meeting rooms, motion picture theaters, dining and banquet halls have also been reserved for technical discussions and special events scheduled during the week.

Special Events

Many special features are scheduled for the Cleveland Metal Show. Each day, Monday through Friday, there will be the round table discussions on the Show's theme "Economy in Production." Eight of these round table sessions will be held. Another feature will be the "Economy Theatre." This will enable exhibitors having motion pictures depicting "Economy in Production" through the use of their equipment, processes or services, to show such films to responsive and interested audiences in one of the "Economy Theatres." During the week of the Metal Show there will be regular published schedules of these motion pictures. They will be shown in one of the many exhibit halls in the Cleveland Public Auditorium.

Seminar sessions on "Thermodynamics in Physical Metallurgy" will occur on Saturday and Sunday—morning, afternoon and evening on Saturday, October 15, and morning and afternoon on Sunday, October 16. These important technical meetings sponsored by the American Society for Metals will be held in Cleveland's Hotel Statler.

Educational lecture courses, technical programs and other special meetings by the sponsoring societies will be held each day during the week of October 17-21. The ASM Metallographic display will be a permanent exhibit during the week of the Metal Show.

Technical Programs

The four sponsoring Societies, through their scheduled seminars, lecture sessions and meetings on technical subjects pertaining to metals production, treating and processing, will provide Show visitors with daily opportunity to hear vital technical subjects discussed and analyzed by some of the country's leading engineers and teachers.

The American Society for Metals and the American Welding Society will hold morning, afternoon and evening sessions throughout the week.

The Metals Branch, American Institute of Mining and Metallurgical Engineers will have daily and evening sessions Monday through Wednesday.

The Society for Non-Destructive Testing have scheduled morning and afternoon technical sessions on Wednesday and Thursday.

Round Table-Forums

Eight sessions of Round Table-Forum discussions will bring together the knowledge and experience of the Nation's top production experts who will meet daily in one of the many spacious halls reserved for that purpose in the Cleveland Public Auditorium.

The Metal Show's theme "Economy in Production" will be broken down into specific operational phases, with qualified leaders selected to monitor each session. Well known specialists will participate. Each of these specialists will introduce his solution to a specific production problem, and each of the panel experts will then bring up related problems for possible solution in a round table discussion.

Among the topics to be discussed during the round table sessions are such important items as "Cost Cutting by Use of More Precise Castings of Formed Shapes", "Cost Cutting by Improved Heat Treatment Operations", "Economy in Production in Brazing, Soldering and Welding of Sub-Assemblies", "Economy in Production Through Improved Welding Techniques and Equipment" and "Economy in Production Through the Use of Improved and More Adaptable Mill Products". These and other vital production operations will receive thorough and able treatment by men who have both theoretical knowledge and practical experience in their respective fields.

Economy Theatre

Management of the Metal Show has arranged facilities for the showing of films which have a definite contribution to production savings. Motion Pictures having as their principal appeal the reduction of production costs through methods, products or equipment can be exhibited in one of the "Economy Theatres" in Cleveland's Public Auditorium. Audiences for these showings will accrue as a result of published schedules during the Show, each exhibitor's film being alloted a specified period in one of the Theatres.

"Economy Theatre" will provide a much needed service for the many companies having films which qualify for showing. Complete set-up for the exhibition of these films will be established, including licensed operators, adequate projection equipment and other services necessary for a professional job.

Metallographic Exhibit

The fourth Metallographic Exhibit of the American Society for Metals will be held in a large area in Cleveland's Public Auditorium which has been reserved so that entries can be displayed to best advantage.

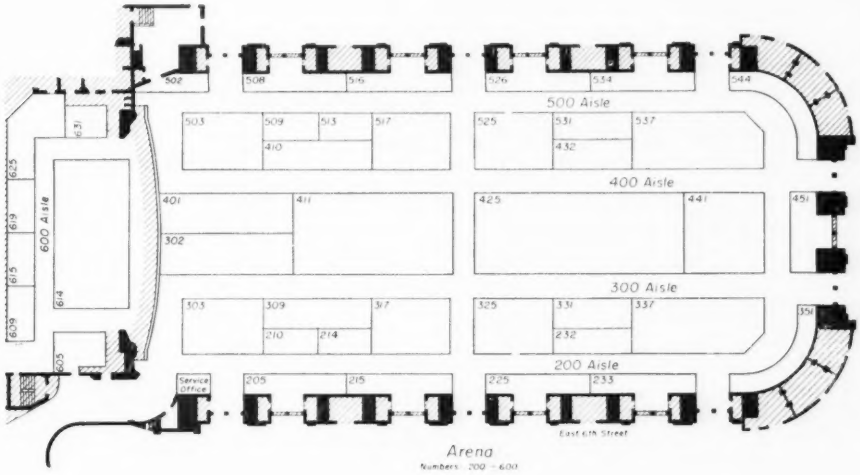
Entries in the ASM Metallographic Exhibit have been invited on the basis of a dozen different classifications. Micrograph studies of Cast Iron and Steel, Toolsteels, Alloys, Light and Nonferrous metals, Stainless and many other types will be on display, both in photograph halftones and as transparencies.

A committee of judges, appointed by the Metal Congress management, will award a first prize (a blue ribbon) to the best entry in each classification. Honorable mentions will also be awarded other entries which, in the opinion of the judges, closely approach the winner in excellence.

A Grand Prize, consisting of a certificate and a money award of $100 will be presented to the exhibitor whose work is adjudged "best in the show". The Grand Prize entry will become the property of the American Society for Metals and will later go on permanent display in the Sauveur Memorial Room at the Society's National Headquarters in Cleveland.

List of Exhibitors

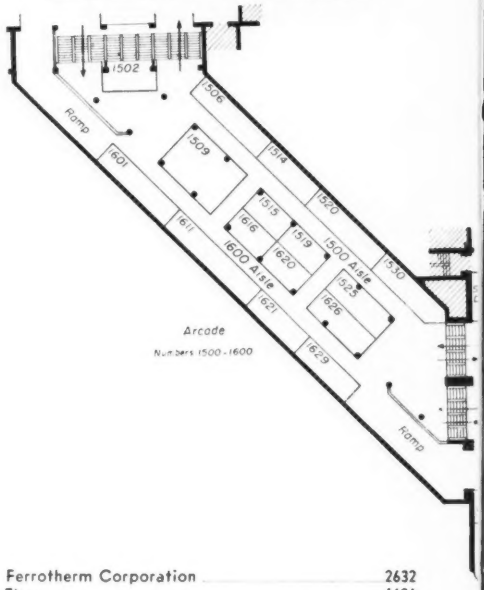
Company	Booth
A	
Acme Manufacturing Company	826
Acme Steel Company	1836
Acme Tool Company	1758
Air-Flo Compressor Company	1750
Air Force	2715
Air Reduction Sales Company	2126
Ajax Electric Company	1901
Ajax Electrothermic Corporation	1901
Ajax Engineering Corporation	1901
Allen Manufacturing Company	1615
Allis-Chalmers Manufacturing Company	1215
Allison Company	2008
Alloy Casting Company Division	210
Alloy Engineering and Casting Company	210
Aluminum Company of America	2627
American Brake Shoe Company	325
American Brass Company	331
American Chain & Cable Co., Inc.	925
American Cyanamid Company	1704
American Emblem Company	1809
American Forge Division	325
American Gas Association	2844
American Gas Furnace Company	2745
American Machine & Metals, Inc.	1709
American Machinist	1428
American Manganese Steel Division	325
American Metal Market	1118
American Non-Gran Bronze Company	2819
American Optical Company	1617
American Platinum Works	2242
American Pullmax Company, Inc.	2521
American Society for Metals	2759
American Wheelabrator & Equipment Co.	2016
Ames Precision Machine Works	2817
Ampco Metal, Inc.	315
Anchor Drawn Steel Company	1401
Anker-Holth Manufacturing Company	2650
Applied Hydraulics	1621
Arcos Corporation	1125
Army, Department of	2715
Aronson Machine Company	2560
Arwood Precision Casting Corporation	2411
Aurora Metal Company	1620
Austenal Laboratories, Inc.	931
Auto Arc-Weld Manufacturing Company	2566
Automotive Industries	1754
B	
B-A Coupling Company, Inc.	1528
Baker & Company, Inc.	2419
Baldwin Locomotive Works	1033
Bastian-Blessing Company	437
Bath Corporation, Cyril	2138
Bausch & Lomb Optical Company	432
Bishop & Company, J.	2007
Black Drill Company	303
Blakeslee & Company, G. S.	2236
Braeburn Alloy Steel Corporation	317
Bridgeport Brass Company	825
Bruning Co., Inc., Charles	2101
Brush Beryllium Company	2554
Brush Development Company	1114
Buehler Limited	513
Bundy Tubing Company	1214
By-Products Steel Company Division	503

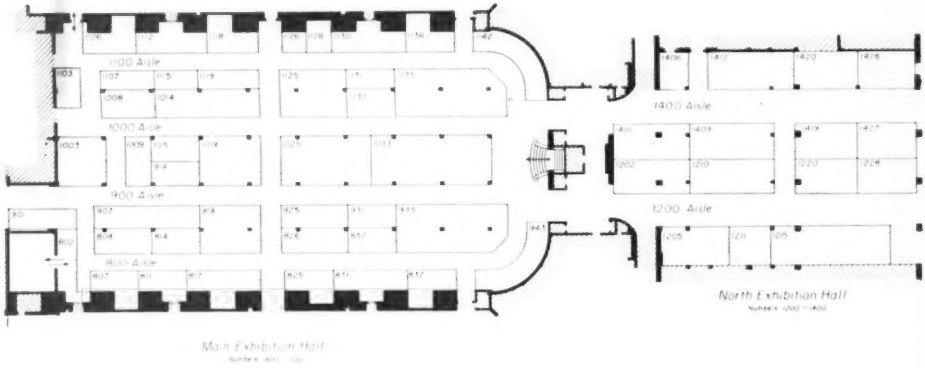


Company	Booth
C	
Campbell Machine Division	925
Carpenter Manufacturing Company	1528
Central Scientific Company	1506
Champion Rivet Company	531
Chilton Company, Inc.	1202 and 1754
Cincinnati Milling & Grinding Machines, Inc.	1826
Cities Service Oil Company	919
Clark Sales Corporation	1528
Cleco Division, Reed Roller Bit Company	2562
Cleveland Electric Illuminating Company	526
Cleveland Punch & Shear Works Company	1837
Climax Molybdenum Company	338
Clinton Machine Company, Inc.	219
Coast Metals, Inc.	2329
Colonial Steel Division	1401
Commerce Pattern Foundry & Machine Co.	2015
Commercial Shearing & Stamping Company	1738
Consolidated Engineering Corporation	2514
Contour Marker Corporation	2531
Crane Packing Company	836
D	
Delta File Works, Inc.	1753
Detrex Corporation	1210
Detroit Testing Machine Company	1616
Die Castings	1621
Dietert Company, Harry W.	214
Distillation Products, Inc.	1907
DoAll Company	1135
Doughty Laboratories	534
Dow Chemical Company	401
Driver Company, Wilbur B.	1427
E	
Ecco High Frequency Corporation	2748
Eclipse Fuel Engineering Company	2847
Ekstrand & Tholand, Inc.	2532
Electric Furnace Company	1014
Electro Alloys Division	325
Elgin National Watch Company	351
Engineered Castings Division	325
Erickson Tool Division	808
Eutectic Welding Alloys Corporation	1703

Company	Booth
F	
Fawick Airflex Company, Inc.	2537
Ferner Company, R. Y.	548
Ferrotherm Corporation	2632
Flow	1621
Foote Mineral Company	2132
Forest City Foundries Company	1108
Foster Transformer Company	1025
Foundry	1419
Fulton Foundry & Machine Company, Inc.	811

FLOOR PLANS OF CLEVELAND AUDITORIUM

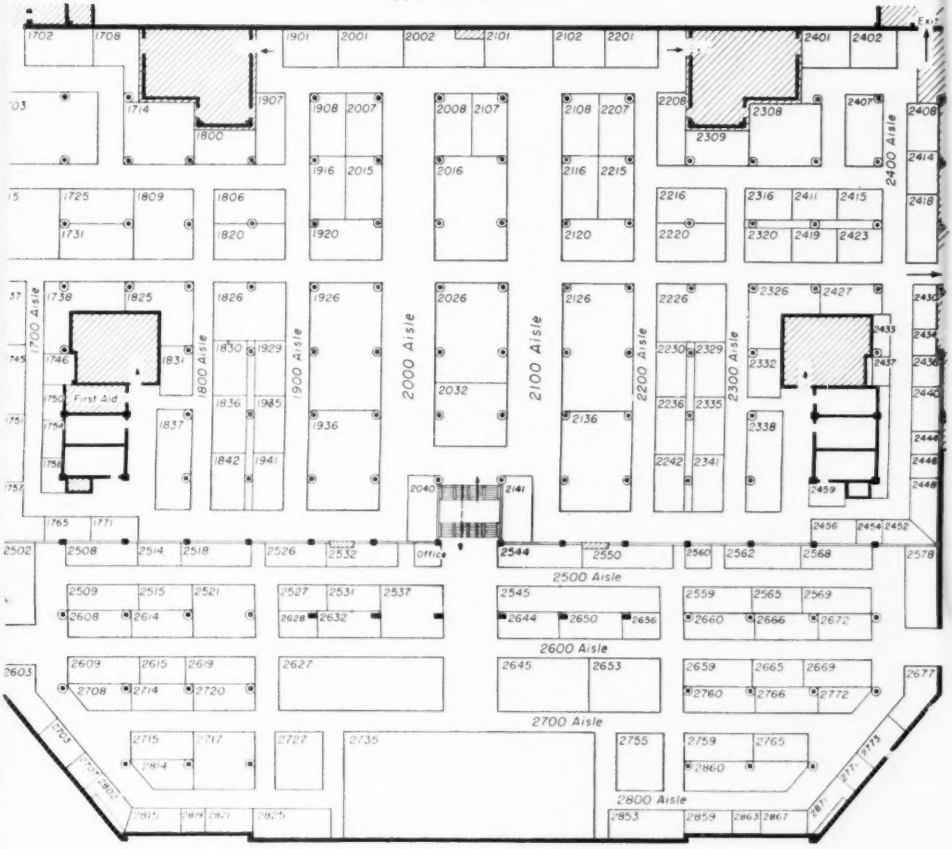




Company	Booth
G	
Gardner Publications, Inc.	2550
Gas Appliance Service, Inc.	2739
Gas Machinery Company	2835
General Alloys Company	441
General Aniline & Film Corporation	2427
General Electric Company	2108
Globe Stamping Division	907
Goodrich Company, B. F.	1916
Gordon Company of Ohio, Claud S.	2744
Gray Iron Founders' Society, Inc.	2859
Gulf Oil Corporation	837
H	
H & H Research Company	1758
HPL Manufacturing Company	1825
Hamilton Manufacturing Company	2141
Hammond Machinery Builders, Inc.	1142
Handy & Harman	337
Harnischfeger Corporation	1806
Harper Electric Furnace Corporation	1106
Harshaw Chemical Company	1532
Harvey Machine Company, Inc	2220
Haskell Manufacturing Company, Inc.	2802
Hauck Manufacturing Company	2703
Hayes, Inc., C. I.	1842
Haynes-Stellite Company	1926
Heil Process Equipment Corporation	2628
Heppenstall Company	1115
Hevi Duty Electric Company	509
Hobart Brothers Company	2544
Holcroft & Company	2614
Hones, Inc., Charles A.	2848
Houghton & Company, E. F.	939
Hupp Corporation	907

Numbers 1700–2400

Upper Exhibition Hall

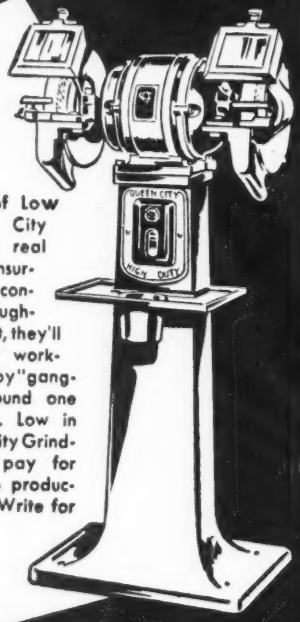


Lower Exhibition Hall

Numbers 2500–2800

SAVE TIME, MONEY

with rugged QUEEN CITY GRINDERS



A battery of Low Cost Queen City Grinders is real production insurance. Placed conveniently throughout your plant, they'll stop wasted work-hours caused by "ganging up" around one lone grinder. Low in cost, Queen City Grinders quickly pay for themselves in production gained. Write for Catalog.

QUEEN CITY

MACHINE TOOL CO.

233 E. 2nd St.,

CINCINNATI 2, OHIO

Company	Booth
I	
Illinois Testing Laboratories, Inc.	935
Industrial Heating	1746
Industrial Press	202
Industrial Publishing Company	1621
Instant Tool Corporation	2869
Institute of Industrial Launderers, Inc.	1757
International Nickel Company, Inc.	302
Invincible Vacuum Cleaner Manufacturing Co.	2520
Ipsen Industries, Inc.	2645
Iron Age	1202
J	
Jackson Products	2660
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Jensen Specialties, Inc.	2325
K	
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King, Andrew	244
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L	
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Lake City Malleable Company	2338
Lakeside Steel Improvement Company	232
Laminated Shim Company, Inc.	1128
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Linde Air Products Company	1926
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Liquid Carbonic Corporation	1116
Lithium Company	2749
Lukens Steel Company	503
Lukenweld Division	503
M	
Machine Design	1419
Machinery	202
Magnaflux Corporation	1015
Magnetic Analysis Corporation	1119
Magnetrode Corporation	2825
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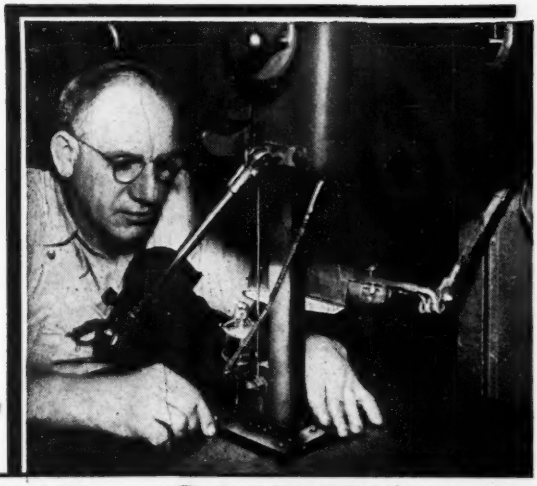

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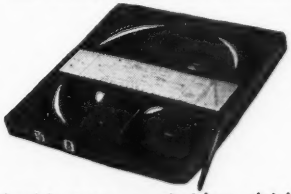

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Miller Company, J. C.	2341
Milne & Company, A.	314
Mir-O-Col Alloy Company	1120
Miskella Infra-Red Company	814
Modern Machine Shop	2550
Morton-Gregory Corporation	2230
Moto-Truc Company	2208
N	
National Bearing Division	325
National Carbon Company, Inc.	1926
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National Industrial Publishing Company	746
National Lead Company	2559
National Military Establishment	2715
National Radiator Company	1510
National Research Corporation	2662
National Spectrographic Laboratories, Inc.	1228
Navy, Department of	2715
Nelson Stud Welding Division	2230
New Equipment Digest	1419
New Jersey Zinc Company	415
Nickel Plate Railroad	225
North American Manufacturing Company	1136
North American Philips Company	832
O	
Oakite Products, Inc.	2565
Ohio Crankshaft Company	537
Ohio Seamless Tube Company	1032
Olsen Testing Machine Company	1830
O'Neil-Irwin Manufacturing Company	451
Optimus Equipment Company	1737
Osborn Manufacturing Company	817
Ozalid Division	2427
P	
Pangborn Corporation	1715
Park Chemical Company	544
Pantlow Corporation	2418
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Precision Shapes, Inc.	2771
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Precision Welder and Machine Company	1817
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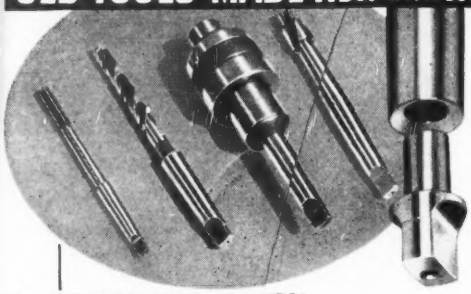

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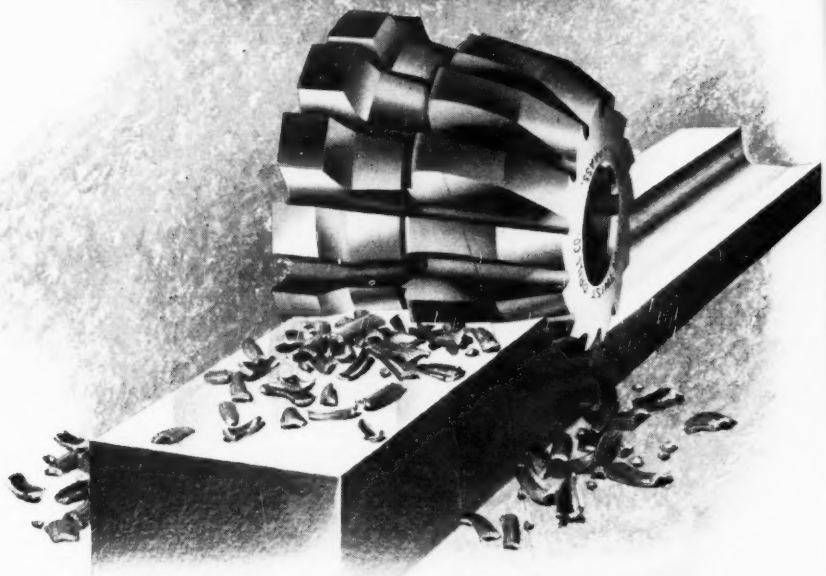

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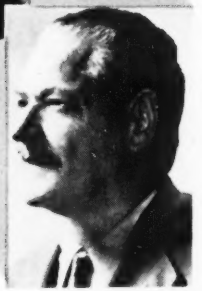

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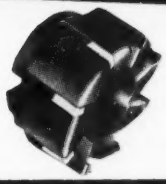

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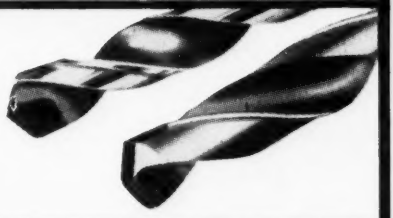

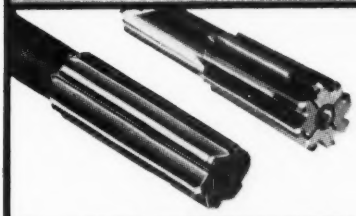

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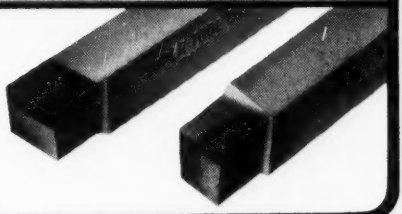

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ASM Seminar on Thermodynamics in Physical Metallurgy

THE American Society for Metals will hold its important technical Seminar at Hotel Statler, Cleveland on Saturday and Sunday, October 15-16, the two days just preceding the regular opening of the 31st National Metal Congress and Exposition on Monday, October 17th.

The Seminar sessions will cover the subject of "Thermodynamics in Physical Metallurgy". The fifteen leading Metallurgists, Mathematicians, Physicists and Researchers who will deliver papers in this Seminar are as follows:

Saturday, October 15

9:30 A.M.

The Principles of Thermodynamics, by P. W. Bridgman, Professor of Mathematics, Harvard University

Contributions of Statistical Mechanics, by C. Zener, Associate Director, University of Chicago, Institute for the Study of Metals

Application of Thermodynamics to Heterogeneous Equilibria, by L. S. Darken, Research Chemist, U. S. Steel Corporation

Application of Electromotive Force Measurements of Phase Equilibria, by F. J. Dunkerley, Assistant Professor of Metallurgy, University of Pennsylvania

2:00 P.M.

Some Physical Interpretations of Constitution Diagrams, by A. W. Lawson, Associate Professor of Physics, University of Chicago, Institute for the Study of Metals

Thermodynamics of Liquids, by John Chipman, Professor and Head, Department of Metallurgy, Massachusetts Institute of Technology

Physical Factors Affecting Order, by C. E. Birchenall, Assistant Professor of Metallurgy, Carnegie Institute of Technology

8:00 P.M.

Mechanism of Diffusion, by Frederick Seitz, Professor and Head, Department of Physics, Carnegie Institute of Technology

Nucleation, by J. H. Hollomon, Research Associate, General Electric Company

Sunday, October 16

9:30 A.M.

Precipitation, by Charles Wert, University of Chicago, Institute for the Study of Metals

Eutectoid Decompositions, by John Fisher, Research Associate, General Electric Company

Martensite Transformations, by Morris Cohen, Professor of Metallurgy, Massachusetts Institute of Technology

2:00 P.M.

Magnetic Domains, by Lieuwe Dijkstra, Research Associate, University of Chicago, Institute for the Study of Metals

Principles Governing Solidification, by D. Turnbull, Research Associate, General Electric Company

Role of Thermodynamics in Metallurgical Research, by J. B. Austin, Director, U. S. Steel Corporation Laboratories

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Program of ASM Technical Papers

Technical Sessions at the Cleveland Public Auditorium
Monday, October 17 — 9:30 A.M.

Alloy Steels Session I.

Joint Chairmen—W. R. Breeler, Allegheny-Ludlum Steel Corporation and M. F. Hawkes, Carnegie Institute of Technology

Tensile Properties of a Heat Treated Low Alloy Steel at Sub-Zero Temperatures—By E. J. Ripling, Research Associate, Case Institute of Technology

Relationship of Inclusion Content and Transverse Ductility of a Chromium-Nickel-Molybdenum Gun Steel—By John Welchner, Metallurgical Engineer, and Walter G. Hildorf, Metallurgical Consultant, Timken Roller Bearing Company

The Effect of Vanadium and Carbon on the Constitution of High Speed Steel—By Donald J. Blickwede, Head, High Temperature Alloys Section, Naval Research Laboratory; Morris Cohen, Professor of Physical Metallurgy, Massachusetts Institute of Technology, and George A. Roberts, Vanadium-Alloys Steel Company

Unnotched Impact Strength of High Speed Steels—By Arthur H. Grobe, Research Metallurgist, and George A. Roberts, Chief Metallurgist, Vanadium-Alloys Steel Company

Monday, October 17 — 2:00 P.M.

Alloy Steels Session II.

Joint Chairmen—R. S. Archer, Climax Molybdenum Company and G. A. Roberts, Vanadium-Alloys Steel Company

Effect of Boron and Kind of Boron Addition Upon the Properties of Steel—By R. A. Grange and W. B. Seens, Members of Staff, U. S. Steel Corporation, Research Laboratory, and W. S. Holt and T. M. Garvey, Metallurgical Department, Carnegie-Illinois Steel Corporation

Characteristics and Properties of Cast Low-Chromium-Molybdenum Steels—By N. A. Ziegler, Research Metallurgist, W. L. Meinhart, Assistant Research Metallurgist, and J. R. Goldsmith, Metallurgical Engineer in Charge of Research Foundry, Crane Company

Iron Manganese and Iron-Manganese Nickel Alloys—By Irvin R. Kramer, Head, Mechanics and Materials Branch, Office of Naval Research, Stewart L. Toleman, Metallurgist, Naval Research Laboratory, and Walter T. Haswell, Metallurgist, Latrobe Steel Company

Metallurgical Factors Affecting the Magnetic and Mechanical Properties of Iron-Cobalt Alloys—By J. K. Stanley, Magnetic Department, Westinghouse Electric Corporation

Tuesday, October 18 — 9:30 A.M.

Oxidation Session

Joint Chairmen—M. G. Fontana, Ohio State University and C. A. Zapffe, Consultant

The High Temperature Oxidation of Manganese—By R. S. Gurnick, Research Engineer, Thompson Products, Inc., and W. M. Baldwin, Jr., Research Professor, Case Institute of Technology

Determination of Oxygen in Metals by the Vacuum Fusion Method—By R. K. McGeary, J. K. Stanley, and T. D. Yensen, Westinghouse Research Laboratories

Methods of Determining Vapor Pressure of Metals—By Rudolph Speiser, Associate Supervisor, and H. L. Johnston, Director, Cryogenic Laboratory, Ohio State University

An X-Ray Study of the Scale Formed on Iron Between 400 and 700° C—By O. A. Tesche, Government Metallurgical Lab., University of the Witwatersrand, Johannesburg, South Africa

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511 Terminal Tower, Cleveland 13, Ohio

Tuesday, October 18 — 9:30 A.M.

Quenching Session

Joint Chairmen—M. Cohen, Massachusetts Institute of Technology and E. S. Rowland, Timken Roller Bearing Company

A Quench Cracking Susceptibility Test for Hollow Cylinder—By Cyril Wells, Member of Staff, Metals Research Lab., Carnegie Institute of Technology, C F. Sawyer, Metallurgist, Vanadium-Alloys Steel Co., I. Broverman, Los Alamos Scientific Lab., and R. F. Mehl, Director, Metals Research Lab., Carnegie Institute of Technology

An Engineering Analysis of the Problem of Quench Cracking in Steel—By Cyril Wells, Members of Staff, Metals Research Lab., Carnegie Institute of Technology, and J. W. Spretnak, Associate Professor of Metallurgy, Ohio State University

Pre-Bore Quench for Hollow Cylinders—By J. W. Spretnak, Associate Professor of Metallurgy, Ohio State University, and C. C. Busby, Metals Research Lab., Carnegie Institute of Technology

Statistical Methods for Evaluating the Quality of Certain Wrought Steel Products—By Edwin G. Olds, Associate Professor, Mathematics Dept. and Cyril Wells, Member of Staff, Metals Research Lab., Carnegie Institute of Technology

Tuesday, October 18 — 2:00 P.M.

High Temperature Metallurgy Session

Joint Chairmen—H. C. Cross, Battelle Memorial Institute and J. J. Kanter, Crane Company

Influence of Strain Rate and Temperature on the Creep of Cold-Drawn Ingot Iron—By W. D. Jenkins and T. G. Digges, Chief, Thermal Metallurgy, National Bureau of Standards

Stability of AISI Alloy Steels at Elevated Temperatures—By A. B. Wilder, Chief Metallurgist, National Tube Co., and J. O. Light, Chief Metallurgist, Lorain Works, National Tube Company

On the Extrapolation of Short Time Stress Rupture Data—By N. J. Grant, Associate Professor of Metallurgy, and Albert G. Bucklin, Research Assistant in Metallurgy, Massachusetts Institute of Technology

The Tungsten-Iridium Thermocouple for Very High Temperatures—By Walter C. Troy, Supervisor, and Gary Steven, Research Metallurgist, Metals Department, Armour Research Foundation

Wednesday, October 19 — 10:00 A.M.

ASM ANNUAL MEETING

Edward deMille Campbell Memorial Lecture—By E. H. Dix, Jr., Assistant Director of Research, Aluminum Company of America

Wednesday, October 19 — 2:00 P.M.

Transformation In Steels Session and Temper Brittleness Session

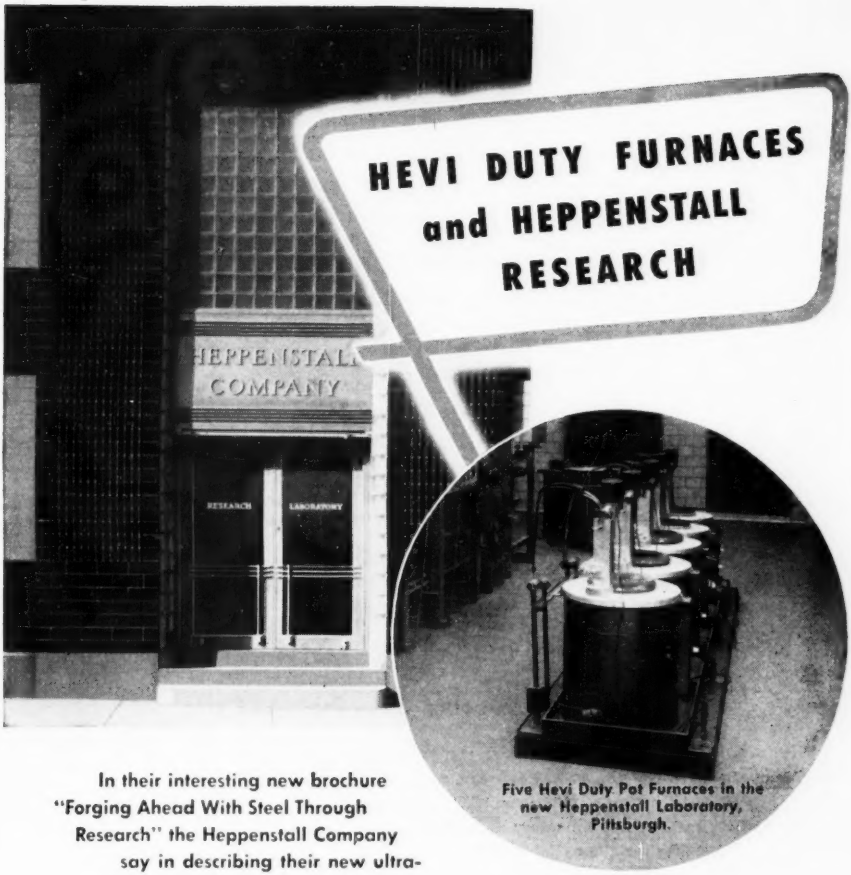
Joint Chairmen—G. A. Timmons, Climax Molybdenum Company and A. R. Troiano, University of Notre Dame

Measurement of Retained Austenite in Carbon Steels—By B. L. Averbach, Assistant Professor, L. S. Castleman, Research Assistant, and M. Cohen, Professor of Metallurgy, Massachusetts Institute of Technology

The Effect of Alloying Elements on the Transformation Characteristics of Induction Hardened Steels—By J. F. Libsch, Assistant Professor of Metallurgy, and W. P. Chuang and W. J. Murphy, Graduate Students, Lehigh University

Influence of Composition of Temper Brittleness in Alloy Steels—By A. P. Taber, Colonel, Ordnance, Department; J. F. Thorlin, Lt. Colonel, Ordnance Department, and J. F. Wallace, Metallurgist, Watertown Arsenal

Isothermal Temper Embrittlement—By L. D. Jaffe and D. C. Buffum, Watertown Arsenal Laboratory



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Thursday, October 20 — 9:30 A.M.

Stainless Steel Session

Joint Chairmen—Russell Franks, Electro Metallurgical Company and V. N. Krivobok, International Nickel Company

A Bar-Bend Test and Its Application to Stainless Steel—By C. A. Zapffe, R. L. Phebus and F. K. Landgraf, Consultants

Creep and Rupture of Several Chromium-Nickel Austenitic Stainless Steels—By G. V. Smith, E. J. Dulis and E. G. Houston, Research Lab., U. S. Steel Corporation

The Effect of Sigma Phase on the Short Time High Temperature Properties of 25 Chromium-20 Nickel Stainless Steel—By Glen J. Guarnieri, James Miller and Frank J. Vawter, Cornell Aeronautical Laboratory, Inc.

Stress Corrosion of a Stainless Steel Compressor Through Unbalanced Dynamic Loading and Exposure to a Mildly Corrosive Solution—By Frank W. Davis, Chief Metallurgist, E. B. Badger & Sons Co.

Thursday, October 20— 2:00 P.M.

Mechanical Metallurgy Session

Joint Chairmen—M. Gensamer, Carnegie-Illinois Steel Corporation and I. R. Kramer, Office of Naval Research

New Equipment for Damping Capacity, Elasticity, and Fatigue Testing and the Correlation of These Properties for Mild Steel—By B. J. Lazan, Professor and Head, Department of Materials Engineering, Syracuse University

Effect of Steady Stress on Fatigue Behavior of Aluminum—By J. A. Sauer, Head, Department of Engineering Mechanics, and D. C. Lemmon, Pennsylvania State College

New Criteria for Predicting the Press Performance of Deep Drawing Sheets—By W. T. Lankford, S. C. Snyder and J. A. Bauscher, Research and Development Division, Carnegie-Illinois Steel Corporation

Fractographic Study of Deformation and Cleavage in Ingot Iron—By C. A. Zapffe and C. O. Worden, Consultants

Friday, October 21 — 9:30 A.M.

Atomic Energy Metallurgy Session

The Metallurgy of Beryllium—By A. R. Kaufmann, Massachusetts Institute of Technology

The Effects of Radiation on Materials—By Sidney Siegel, Atomic Power Division, Westinghouse Electric Corporation, and Douglas Billington, Naval Research Laboratory

Some aspects of uranium metallurgy sub-divided as follows:
Uranium Crystal Structure—By C. W. Tucker, Knolls Atomic Power Laboratory
Elastic Constants of Uranium—By Henry Laquer, Los Alamos National Laboratory
Some Uranium Phase Diagrams—By H. A. Wilhelm, the Ames Laboratory

Friday, October 21 — 2:00 P.M.

Nonferrous Session

Joint Chairmen—W. M. Baldwin, Jr., Case Institute of Technology and K. R. Van Horn, Aluminum Company of America

Fabrication and Mechanical Properties of Ductile Zirconium—By E. T. Hayes, Physical Metallurgist, E. D. Dilling, Metallurgist, and A. H. Roberson, Metallurgist, Bureau of Mines, Northwest Electrodevelopment Laboratory

A Study of Arc-Melted Molybdenum-Rich Chromium-Molybdenum Alloys—By Herold D. Kessler, Research Metallurgist, and M. Hansen, Armour Research Foundation

Effects of Quenching Rate and Quench-Aging on the Tensile Properties of Aluminum Alloy 61S—By R. C. Lemon, Research Metallurgist, and H. Y. Hunsicker, Assistant Chief, Cleveland Research Division, Aluminum Company of America

Preparation of Metal Single Crystals—By A. N. Holden, Research Laboratory, General Electric Company

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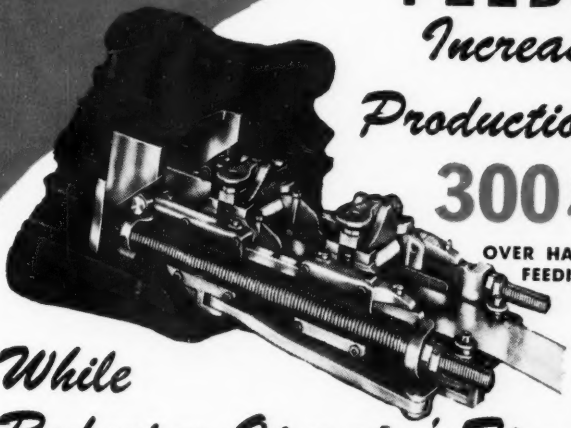

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ASM Educational Lectures

Machining—Theory and Practice

Monday, October 17 — 4:15 P.M.

Symposium Keynote—By Hans Ernst, Director of Research, Cincinnati Milling Machine Company

Metal Cutting Research—By M. E. Merchant, Physicist, Cincinnati Milling Machine Company

Cutting Fluid Theory—By Milton Shaw, Assistant Professor of Mechanical Engineering, Massachusetts Institute of Technology

Monday, October 17 — 8:00 P.M.

Materials and Machinability—By F. W. Boulger, Supervising Metallurgist, Battelle Memorial Institute

Metallurgy and Machinability of Steels—By J. D. Armour, Chief Metallurgist, Union Drawn Steel Division, Republic Steel Company

Tool Steels—By George A. Roberts, Chief Metallurgist, Vanadium-Alloys Steel Company

Tuesday, October 18 — 4:15 P.M.

Cemented Carbide Tool Materials—By J. C. Redmond, Kennametal, Incorporated

Heat in Metal Cutting—By A. O. Schmidt, Research Engineer, Kearney and Trecker

Evaluation of Machinability—By Michael Field and N. Zlatin, Metcut Research Associates

Tuesday, October 18 — 8:00 P.M.

Tool Life Testing—By O. W. Boston, Chairman, Department of Metal Processing, University of Michigan

Some Metallurgical Aspects of Grinding—By L. P. Tarasov, Research Metallurgist, Norton Company

Economics of Machining—By W. W. Gilbert, Assistant Professor, University of Michigan

Development of the Macrostructure of Metals by Machining—By L. M. Clarebrough and G. J. Ogilvie, University of Melbourne

Stress Corrosion in Metals

Wednesday, October 19 — 4:15 P.M.

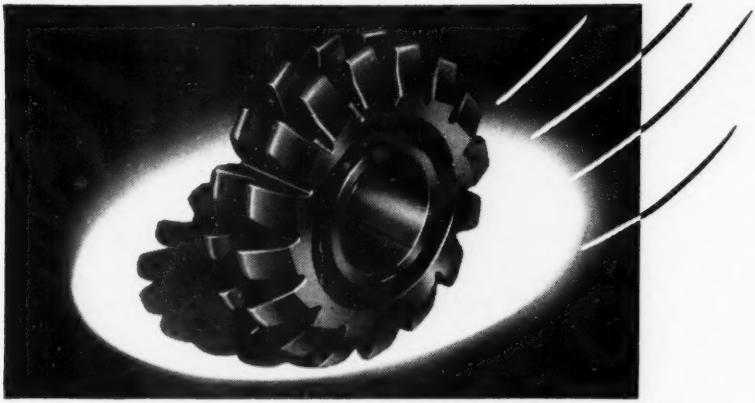
Generalized Theory of Stress Corrosion—By J. T. Wabor, Staff Metallurgist, University of California, Los Alamos Scientific Laboratory

Wednesday, October 19 — 5:15 P.M.

Corrosion Fatigue and Stress Corrosion as Encountered in a Practical Way in the Petroleum Industry—By M. E. Holmberg, Engineer, Phillips Petroleum Company

Wednesday, October 19 — 8:00 P.M.

Stress Corrosion Phenomenon Encountered with Stainless Steels and Other High Alloy Materials—By M. A. Scheil, Metallurgist, A. O. Smith Corporation



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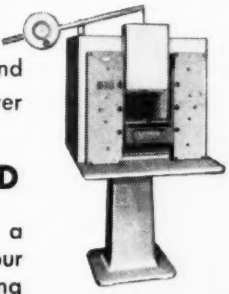

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1949 ASM Award Winners

PRESENTATION of three top awards will be a feature of the annual dinner of the American Society for Metals, Thursday, October 20th, which will be held in the Grand Ballroom of Hotel Statler, Cleveland, Ohio.

Marcus A. Grossmann

The Albert Sauveur Achievement Award

THE Sauveur Achievement Award, established by the American Society for Metals in 1934, will be presented in 1949 to Dr. Marcus A. Grossmann, Director of Research, Carnegie-Illinois Steel Corporation. The purpose of the Award is to recognize pioneering Metallurgical achievements which have stimulated organized work along similar lines to such an extent that a marked basic advance has been made in Metallurgical knowledge. Dr. Grossmann is the thirteenth Metal Scientist to receive the Award since it was first established and presented in 1934 to Dr. Albert Sauveur, the late Harvard Professor, and widely known as the "Dean of American Metallurgists."

Edgar Collins Bain

Gold Medal

DR. EDGAR COLLINS BAIN, Vice President, Carnegie-Illinois Steel Corporation, is the 1949 recipient of the American Society for Metals' Gold Medal. The Gold Medal of the American Society for Metals was established in 1943 to recognize outstanding metallurgical knowledge and exceptional ability in the diagnosis and solution of diversified metallurgical problems.

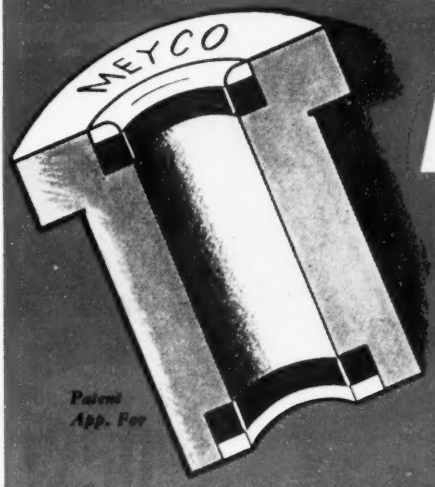
Dr. Bain is a past President of the American Society for Metals and has made notable contributions to the art and science of Metals through his active membership in the Society. The 1949 Gold Medalist was the Henry Marion Howe lecturer in 1931 and the Edward deMille Campbell lecturer in 1932. In 1946 Dr. Bain received the Albert Sauveur Achievement Medal from the Society, and in 1948 he received the Distinguished Service Award for his meritorious contributions to progress in Alloy Steel.

Fred H. Haggerson

Medal for the Advancement of Research

THE 1949 Medal for the Advancement of Research has been awarded to Fred H. Haggerson, President of Union Carbide and Carbon Corporation, and one of Industry's leading exponents of consistent research.

The ASM Medal for the Advancement of Research is based on these qualifications which Mr. Haggerson fulfills to a high degree: "The candidate shall be an executive in an industrial organization, the principal activity of which is the production and fabrication of metals. He shall be one who, over a period of years, has consistently sponsored metallurgical research or development and by his foresight and his influence in making available financial support, has helped substantially to advance the arts and sciences relating to metals."



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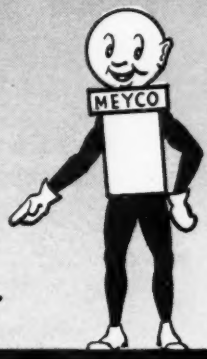

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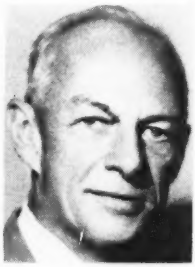

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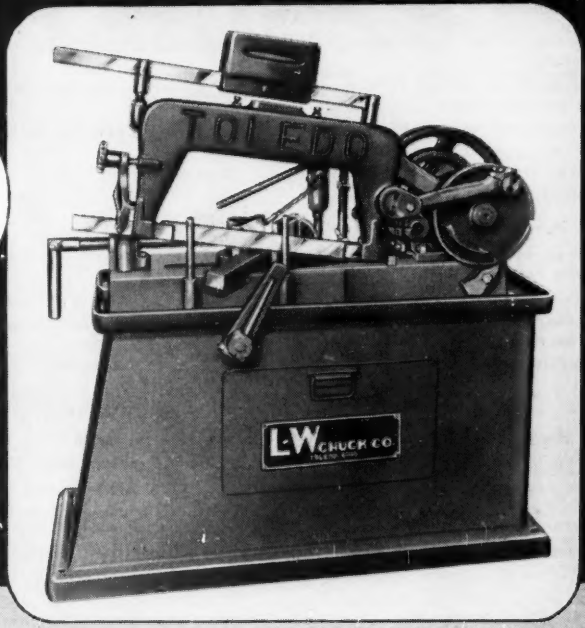

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Program of AWS Technical Papers

Technical Sessions at the Cleveland Hotel

Monday Morning, October 17, 1949

Structural Design

Design and Construction of a Modern Welded Deck Girder Highway Bridge—By Ned L. Ashton, State University of Iowa

Economical Design of Welded Buildings—By Robert E. Robertson, Jr., Saxe, Williar & Robertson, Engineers and Consultants

Proposed Design of Welded Rigid Frames for New York Subways—By Martin P. Korn, Consulting Engineer

A Strain Gage Test and Analysis of an Eighty-Foot H-Section Welded Truss—By A. Waidelich, The Austin Company

Pressure Vessels

Importance of Design in Construction of Tanks and Pressure Vessels—By Walter Samans, Chairman, Pressure Vessel Research Committee

Trends in Fabrication by Welding—By S. V. Williams, Struthers-Wells Corporation

Inert-Gas-Shielded Arc-Welding Aluminum Pressure Vessels—By A. J. Hopper, Welding Engineers, Incorporated

Notch Sensitivity of Mild Steel Plates—By A. R. Bagsar, Sun Oil Company

Hard Facing and Flame Hardening

Automatic Electric Hard Facing—By Turner G. Brashear, Jr., Leader Welding and Mfg. Company

Hot Hardness of Hard-Facing Alloys—By Howard S. Avery American Brake Shoe Company

Hard-Facing Applications in the Steel Industry—By J. J. Barry, Air Reduction Sales Co.

Flame Hardening of Large Diameter Rounds—By S. Smith, Air Reduction Sales Company

Monday Afternoon, October 17, 1949

Nonferrous Metals

Arc Welding of Molybdenum—By I. S. Goodman, Westinghouse Electric Corporation

The Welding of High-Nickel Alloys to Other Metals—By G. R. Pease and H. B. Bott, International Nickel Company

Seam Welding Monel Metal to Steel—By Ernest F. Nippes, Allan R. Pfluger and Gerald M. Slaughter, Rensselaer Polytechnic Institute

Education

Welding in Engineering Education—By R. S. Green, Ohio State University

Formal Training of Welding Personnel—By Allen C. Tyler, Acting Dean, LeTourneau Technical Institute

Continuation of Study of Welding and Welding Processes—By Frank W. Scott, Marquette Mfg. Company, Incorporated

Research

The Statistical Part in Welding Investigations—By B. B. Day, Statistician, Director's Staff, U. S. Naval Engrg. Experimental Station

Brittle Failure and Size Effect in a Mild Steel—By K. J. Stodden and E. P. Klier, Pennsylvania State College

Weld-Peening Investigations—By J. Lyell Wilson, American Bureau of Shipping

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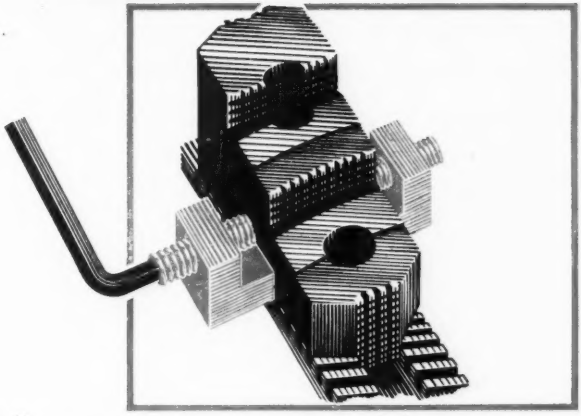

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Monday Afternoon, October 17, 1949

Educational Lecture Series

Designing for Welding—By H. W. Pierce, New York Shipbuilding Corporation

Monday Evening, October 17, 1949

Awards of Prizes and Medals

1949 ADAMS LECTURE

The Advantages and Disadvantages of Electric Welding as a Means of Fabricating Steel Structures—By W. M. Wilson, University of Illinois

Tuesday Morning, October 18, 1949

Symposium on Ship Structure Research

Introduction "The Work of the Ship Structure Committee"—By Rear Admiral Ellis Reedhill, U.S.C.G. Chairman, Ship Structure Committee

Factors Influencing the Tensile Behavior of Notched Flat Plate Specimens—By Professor S. T. Carpenter and Captain W. P. Roop, U.S.N. (Ret.), Swarthmore College

Correlation of Test Results—By Dr. C. F. Tipper, University of Cambridge, England

Tests of Slotted Plates—By E. M. MacCutcheon, C. L. Pittiglio, David Taylor Mode Basin, U.S.N., and R. H. Raring, National Research Council

Further Study of the Navy Tear Test—By Noah Kahn and Emil Imbembo, New York Naval Shipyard

Resistance Welding

Material Consumption Rates and Flashing Characteristics—By William N. Platte, Westinghouse Electric Corporation

Factors Affecting the Quality of Production Flash Welding—By E. Sirabian, Arnold, Schwinn & Company

The Homopolar Generator Stored-Energy System for Resistance Welding—By Thomas J. Crawford, Progressive Welder Company

Circuit Analysis of Frequency Changer Welders—By W. K. Boice, General Electric Company

Machinery Welding

Weldment Design and Engineering Practice—By Anthony K. Pandjiris, Pandjiris Weldment Company

Welding of Alloy Steel Shovel Buckets—By E. R. McClung, Lukenweld, Incorporated

Lowering Cost of Welded Construction—By Omer Blodgett, Lincoln Electric Company

Aluminum Bronze Electrodes—By J. A. Cunningham, J. A. Cunningham Equipment, Incorporated

Tuesday Afternoon, October 18, 1949

Symposium on Ship Structure Research

Distribution of Relative Ductility in Steel Weldments—By L. J. Klinger and L. J. Ebert, Case Institute of Technology

Bend and Tensile Specimens Used as Indices of Performance and Weldability—By C. B. Voldrich and P. J. Rieppel, Battelle Memorial Institute

Effect of Cyclic Stress on Impact Transition Curve of Ship—By Professor J. M. Lessells and H. E. Jacques, Massachusetts Institute of Technology

Axial Tension Impact Tests of Structural Steels—By W. H. Bruckner and N. M. Newmark, University of Illinois

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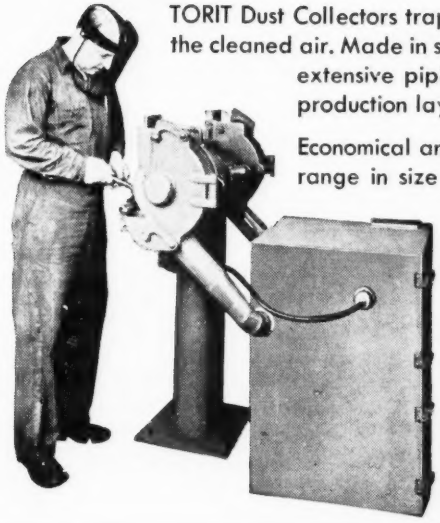

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Resistance Welding

Spotweld Consistency Studies—By Julius Heuschkel and H. C. Bitzer, Westinghouse Research Labs.

Spot Welding Heavy Gage Structural Steel—By Ernest F. Nippes and R. F. Underhill, Jr., Rensselaer Polytechnic Institute

Slope Control and Its Effect on Spot and Projection Welding—By I. W. Johnson, General Electric Company

Miscellaneous

Welding of Zinc-Base Die Castings—By Roland H. Ogden, Alladin Rod & Flux Mfg. Company

Silver Alloy Brazing Stainless Steel—By C. H. Chatfield and A. W. Swift, Handy & Harman

Magnaflux Inspection of Welded Storage Tanks—By F. A. Upson, Standard Oil Company (Indiana)

High Energy Loading Method of Testing Steel Plate and Weldments—By G. S. Mikhalapov, Metallurgical Research and Development Company, Incorporated

Tuesday Afternoon, October 18, 1949

Educational Lecture Series

Designing for Welding—By H. W. Pierce, New York Shipbuilding Corporation

Tuesday Evening, October 18, 1949

PRESIDENT'S RECEPTION

Wednesday Morning, October 19, 1949

Apparatus

Design Features of a Welding Generator with Controlled Reactance—By J. M. Tyrner, Air Reduction Sales Company and O. Kobel, G. D. Peters and Company of Canada, Limited

Measurement of Flux Densities in Steels for Magnetic Particle Inspection—By T. E. Hamill, Naval Gun Factory

Economical Arc Welding—By S. Oestreicher, Harnischfeger Corporation

Resistance Welding

Fatigue Tests of Spot-Welded Mild Steel and Stainless Steel Sheets—By Professor Georges Welter, Ecole Polytechnique, Montreal, Canada

Spot Welding Galvanized Steel—By M. L. Begeman, Millard L. Hipple and L. Cullum, Jr., University of Texas

Electrical Resistance Offered by Non-Uniform Current Flow—By W. B. Kouwenhoven and William T. Sackett, Jr., School of Engineering, Johns Hopkins University

Design and Application of Portable Resistance Welding Tools—By C. H. Davis, Jr., The Budd Company

Aluminum

The Economy of Shielded Arc Welding of Aluminum—By Fritz Albrecht, Glenn L. Martin Company

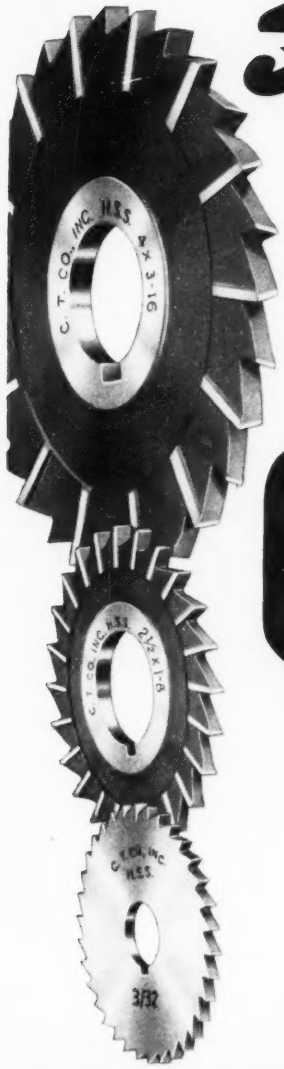
Shear Strength Consistency of Spot Welds in Alclad 24 S-T3—By J. C. Barrett, Glenn L. Martin Company

Heliarc Welding of Aluminum Alloys—By F. H. Stevenson, Modern Metal Spinning & Mfg. Company

Wednesday Afternoon, October 19, 1949

Educational Lecture Series

Designing for Welding—By H. W. Pierce, New York Shipbuilding Corporation



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Wednesday Afternoon, October 19, 1949

Business Meeting—Board of Directors Meeting

Wednesday Evening, October 19, 1949

Section Officers Conference—University Conference

Thursday Morning, October 20, 1949

Arcs and Electrodes

Arc Welding Metal Transfer Analyzer—By R. C. McMaster, D. C. Martin and A. Leatherman, Battelle Memorial Institute

Heat Effects in Anode Spots of High Current Arcs—By Dr. T. Benjamin Jones, Johns Hopkins University

Application of Mild Steel Welding Electrodes—By F. R. Strate, Air Reduction Sales Company and R. I. Strough, Arcrods Corporation

Energy Distribution in Electric Welding—By Clarence E. Jackson and A. E. Shrubsall, Union Carbide and Carbon Res. Labs.

Railroad

Evolution of the Welded Freight Car—By L. E. Grant, Chicago, Milwaukee, St. Paul & Pacific Railroad Company

Oxy-Acetylene Pressure-Welded Rail Saves Maintenance Costs—By Lem Adams, Oxweld Railroad Service Company

Arc Welding in Railroad Shops—By E. DiLiberti, Air Reduction Sales Company

Inert Gas Welding in Railroad Repair and Rehabilitation—By H. E. Gannett, Chicago, Burlington & Quincy Railroad

Weldability

Strain Aging in Welding Low-Carbon Structural Steel—By W. H. Bruckner and S. W. Sandberg, University of Illinois

The High-Frequency Notch Bend Test—By Bola Ronay, U. S. Naval Engineer Exp. Station

Studies Concerning the Strain-Aging of Arc Welds in Mild Steel—By A. E. Flanigan, University of California, Los Angeles

Synthetically Heat Treated Specimens for Weldability—By Ernest F. Nippes and Warren Savage, Rensselaer Polytechnic Institute

Thursday Evening, October 21, 1949

Symposium—For Economy in Production—Weld!

Friday Morning, October 20, 1949

Inert Gas Welding

Heliarc Welding in the Automotive Industry—By F. J. Pilia and R. H. Bennewitz, Linde Air Products Company

Inert Gas Shielded Metal Arc Welding Process—By A. Muller, G. J. Gibson and E. H. Roper, Air Reduction Sales Company

Automatic Heliweld Applications—By H. O. Jones, Air Reduction Sales Company

Applications for Helium in Inert Arc Welding—By M. J. Conway, General Electric Company

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Stainless Steel

Corrosion Resistance of Molybdenum Bearing Stainless Steel Weld Metals—By R. D. Thomas, Jr. and Anton L. Schaeffler, Arcos Corporation

Problems Associated with the Welding of Stainless Clad Steel—By Perry C. Arnold, Chicago Bridge & Iron Company

Resistance Welding Stainless Steel Truck-Trailer Body Components—By Byron Gates, The Budd Company

Stainless Steel Fabrication by Inert-Gas-Shielded Arc Welding—By Charles D. Bonifield, The Globe Company

Gas Cutting

New Developments in Oxyacetylene Cutting Machines—By W. Begerow and A. H. Yoch, Air Reduction Sales Company

Steel Warehouse Shape Cutting with Electronic Tracers—By William O. Springer, Jos. T. Ryerson & Son, Incorporated

Flame Cutting—By James T. Lewis Welding & Engineering Corporation

Powder Cutting and Scarfing Process—By C. W. Powell, Republic Steel Corporation

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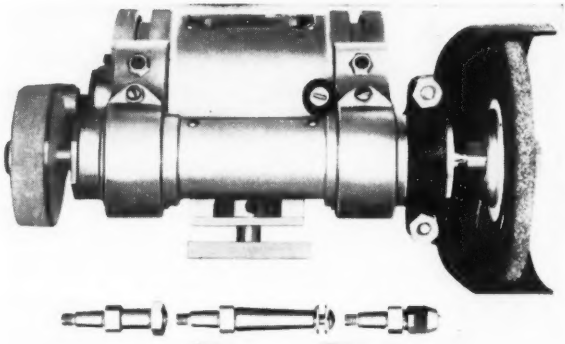

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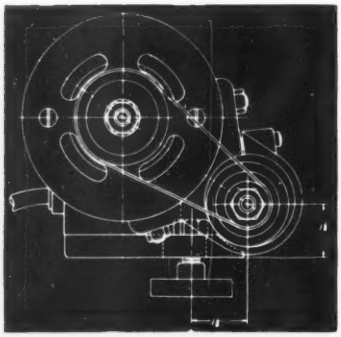

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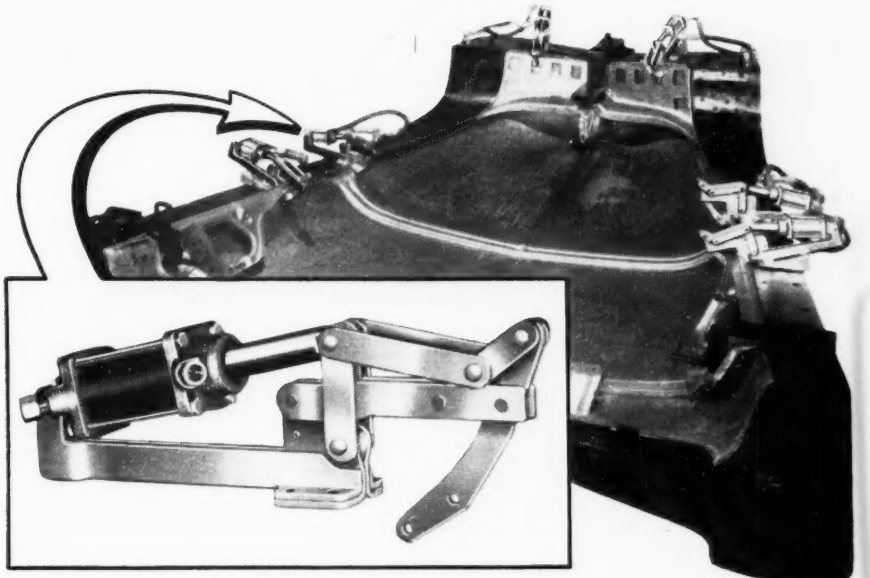

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Program of Metals Branch AIME Technical Papers

Technical Sessions at the Allerton Hotel

Monday, October 17, 9:00 A.M.

Precipitation and Aging

Precipitation Phenomena in the Solid Solution of Nitrogen and Carbon in Alpha Iron below the Eutectoid Temperature—By L. J. Dijkstra, University of Chicago

The Yielding and Strain-Aging of Nitrided Single Crystals of Iron—By H. Schwartzbart and J. R. Low, Jr., Penn State College

The Effect of Quenching on the Age Hardening of Two Aluminum Alloys—By R. D. Barer and M. B. Bever, Massachusetts Institute of Technology

Size Effects in Quenching High Purity Precipitation-Hardenable Alloys—By W. L. Finlay, Remington Arms Company, Incorporated

Fracture and Strain Phenomena

A Metallographic Description of Fracture in Impact Specimens of Structural Steel—By M. Baeyertz, W. F. Craig, Jr. and E. S. Bumps, Armour Research Foundation

The Effect of Ferrite Grain Size on Notch Toughness—By J. M. Hodge, R. D. Manning and H. M. Reichhold, Carnegie-Illinois Steel Corporation

Investigation of Temper Brittleness in Low Alloy Steels—By S. A. Herres and A. R. Elsea, Battelle Memorial Institute

The Effects of Molybdenum and Commercial Ranges of Phosphorous on the Toughness of 0.40 Pct. Carbon Chromium Steels—By M. Baeyertz, W. F. Craig, Jr. and J. P. Sheehan, Armour Research Foundation

Recrystallization

Secondary Recrystallization in Copper—By M. L. Kronberg and F. H. Wilson, American Brass Company

Recovery and Recrystallization in Brass—By B. L. Averbach, Massachusetts Institute of Technology

Recrystallization Texture and Coarsening Texture in High Purity Aluminum—By P. A. Beck and Hsun Hu, University of Notre Dame

Recrystallization and Microstructure of Aluminum Killed Deep Drawing Steel—By R. L. Rickett, U. S. Steel Corporation; S. H. Kalin, Carnegie-Illinois Steel Corporation and J. T. MacKenzie, Jr., U. S. Steel Export Company

Monday, October 17, 2:00 P.M.

Equilibrium Diagrams

The Beryllium-Iron System—By R. J. Teitel, Brookhaven National Laboratories and M. Cohen, Massachusetts Institute of Technology

The Ternary System, Copper-Manganese-Zinc—By T. R. Graham, J. R. Long and C. E. Armantrout, U. S. Bureau of Mines

Solubility of Titanium in Liquid Magnesium—By K. T. Aust and L. M. Pidgeon, University of Toronto

Liquid Solubility of Manganese in a Magnesium-Aluminum-Tin Alloy—By B. J. Nelson and G. F. Sager, Aluminum Company of America

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Fracture and Strain Phenomena

Discontinuous Crack Propagation-Further Studies—By L. D. Jaffe, E. L. Reed and H. C. Mann, Watertown Arsenal Laboratories

Stress and Strain States in Elliptical Bulges—By C. C. Chow, A. W. Dana and G. Sachs, Case Institute of Technology

The Comparative Creep Properties of Several Types of Commercial Coppers—By A. D. Schwope, K. F. Smith and L. R. Jackson, Battelle Memorial Institute

The Active Slip Systems in the Simple Axial Extension of a Single Crystalline Alpha Brass—By R. C. Maddin, C. H. Matthewson and W. R. Hibbard, Jr., Yale University

Electrical Properties of Alloys

P-Type and N-Type Silicon and the Formation of the Photovoltaic Barrier in Silicon Ingots—By J. H. Scaff, H. C. Theurer and E. E. Schumacher, Bell Telephone Laboratories

Microstructure of Silicon Ingots—By W. G. Pfann and J. H. Scaff, Bell Telephone Laboratories

Electrical Properties of the Intermetallic Compounds Mg_2Sn and Mg_2Pb—By W. D. Robertson, University of Chicago and H. H. Uhlig, Massachusetts Institute of Technology

Ferromagnetic Alloys in the Systems Copper-Manganese-Indium and Copper-Manganese-Gallium—By F. A. Hames and D. S. Epplesheimer, Missouri School of Mines and Metallurgy

Tuesday, October 18, 9:00 A.M.

Transformations

Kinetics of Austenite Decomposition—Ferrite Nucleated Products—By J. C. Fisher, J. H. Holomon and D. Turnbull, General Electric Company

Free Energy Changes Accompanying the Martensite Transformation in Steels—By J. C. Fisher, General Electric Company

The Hardenability Effect of Molybdenum—By J. M. Hodge, J. L. Giove and R. G. Storm, Carnegie-Illinois Steel Corporation

Fracture and Strain Phenomena

Simultaneous Aging and Deformation in Metals—By J. D. Lubahn, General Electric Company

The Transverse Bending of Single Crystals of Aluminum—By M. K. Yen, New York University and W. R. Hibbard, Jr., Yale University

Stages in the Deformation of Monel as Shown by Polarized Light—By D. H. Woodard, National Bureau of Standards

Influence of Temperature on the Stress-Strain Energy Relationship for Copper and Nickel-Copper Alloys—By D. J. McAdams, Jr., National Bureau of Standards

Surface Orientation—Phase Relationships

Surface Orientation and Rolling of Magnesium Sheets—By R. L. Dietrich, Dow Chemical Company

Oriented Arrangements of Thin Aluminum Films on Ionic Substrates—By Thor Rhodin, Jr., University of Chicago

Kinetics of the Reactions of Zirconium with O_2, N_2 and H_2—By E. A. Gulbransen and K. Andrew, Westinghouse Research Laboratory

Kinetics of the Reactions of Titanium with O_2, N_2, H_2—By E. A. Gulbransen and K. Andrew, Westinghouse Research Laboratory

Tuesday, October 18, 2:00 P.M.

Transformations

Stable Transformation Nuclei in Solids—By J. N. Hobstetter, Harvard University

The Transformation in B-CuAl Alloys—By E. P. Klier, Penn State College and S. M. Grymko, Battelle Memorial Institute

Transformation of Gamma Manganese to Alpha Manganese—By E. V. Potter, H. C. Lukens and R. W. Huber, U. S. Bureau of Mines

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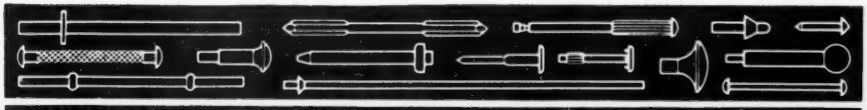

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Structure and Identity of Materials

The Rapid Determination of Orientation of Cubic Crystals—By C. G. Dunn and W. W. Martin, General Electric Company

The Crystal Structure of Ni_4W—By E. Epremian and D. Harker, General Electric Co.

Structure of Diborides of Titanium, Zirconium, Columbium, Tantalum and Vanadium—By J. T. Norton, Massachusetts Institute of Technology, H. Blumenthal and S. J. Sideband, American Electro Metallurgical Corporation

Isolation of Carbides from High Speed Steels—By D. J. Blickwede and M. Cohen, Massachusetts Institute of Technology

Diffusion—Grain Boundaries

The Diffusion and Solubility of Carbon in Alpha Iron—By J. K. Stanley, Westinghouse Electric Corporation

Analysis of Intersitial Diffusion Using Activity Methods—By G. Guy, North Carolina State College

The Study of Grain Boundaries with the Electron Microscope—By J. F. Radavish, Purdue University

Studies of Interface Energies in Some Aluminum and Copper Alloys—By K. K. Ikeuye and C. S. Smith, University of Chicago

Wednesday, October 19, 2:00 P.M.

Annealing Twins—Kink Bands

The Origin of Annealing Twins in Brass—By R. C. Maddin, C. H. Mathewson and W. R. Hibbard, Jr., Yale University

Annealing Twins in Copper and 70-30 Alpha Brass—By W. R. Hibbard, Jr., Jon Chao Liu and S. F. Reiter, Yale University

Structure and Nature of Kink Bands in Zinc—By J. B. Hess and C. S. Barrett, University of Chicago

The Vapor Pressure of Zinc and Cadmium Over Some of Their Silver Alloys—By C. E. Birchenall and C. H. Cheng, Carnegie Institute of Technology

Powder Metallurgy

A Method of Examination of Sections of Fine Metal Powder Particles with the Electron Microscope—By Laurence Delisle (Miss), Sylvania Electric Products, Incorporated

The Pore Size of Hydrogen Reduced Tungsten Powder—By Bernard Kopelman and C. C. Gregg, Sylvania Electric Products, Incorporated

Determination of Boundary Stresses During the Compression of Cylindrical Powder Compacts—By M. E. Shank and John Wulff, Massachusetts Institute of Technology

A Dilatometric Study of the Sintering of Metal Powder Compacts—By Pol Duwez and Howard Martens, California Institute of Technology

Electrical Resistivity Measurements on Iron-Silicon Compacts Prepared by the Powder Metallurgy Procedure—By F. W. Glaser, American Electro Metallurgical Corporation

Titanium—Beryllium

The Lattice Parameters of High Purity Alpha Titanium and the Effect of Oxygen and Nitrogen on Them —By H. T. Clark, Jr., Remington Arms Company, Incorporated

The Effect of Oxygen, Nitrogen and Hydrogen on Iodide Refined Titanium—By R. I. Jaffee and I. E. Campbell, Battelle Memorial Institute

Preparation and Castings of Beryllium Melts—By J. K. Kura, J. A. Jackson, M. C. Udy and L. W. Eastwood, Battelle Memorial Institute

Metallographic Examination of Beryllium Alloys—By M. C. Udy, G. K. Manning and L. W. Eastwood, Battelle Memorial Institute

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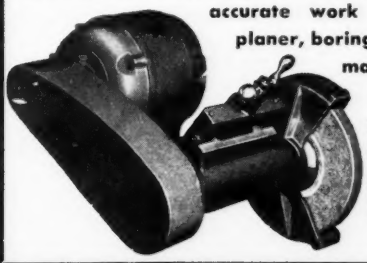

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Program of SNDT Technical Papers

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Non-Destructive Testing Techniques and Equipment

Radium, Tantalium and Cobalt as Sources of Radiation for Industrial Radiography—By G. H. Tenney, Los Alamos Scientific Laboratory.

Sonic Inspection by the Immersion Technique—By Donald Erdman, Triplett & Barton, Incorporated

High Voltage X-Ray Equipment and Technique—By E. E. Charlton, General Electric Research Laboratory

Non-Destructive Hardness Testing—By D. L. Palmer, Scintilla Magnetto Company

Wednesday Afternon, October 19

Industrial Applications of Non-Destructive Testing

Current Applications of Magnetic Analysis Inspection—By W. S. Gould, Magnetic Analysis Corporation

Plastics Inspection by Special Low Voltage X-Ray Equipment—By D. T. O'Connor, Naval Ordnance Laboratory

Testing of Jet Engine Parts—By Tom Piper, Northrop Aircraft Company

Simulated Service Testing for Establishing Non-Destructive Testing Standards—By L. W. Ball, Naval Ordnance Laboratory

Thursday Morning, October 20

Non-Destructive Testing in Industrial Management

Training and Qualifications for a Career in a Commercial X-Ray and Non-Destructive Testing Laboratory —Justin Schneeman, X-Ray Products Corporation

Career Possibilities for Non-Destructive Specialists in a Large Metallurgical Company—By Kent Van Horn, Aluminum Company of America

Peacetime Preparation for Quality Control During Industrial Mobilization—By W. R. Pabst, Quality Control Div., Navy Bureau of Ordnance

Magnetic Inspection Methods—By L. A. Danse, General Motors Corporation

Thursday Afternoon, October 20

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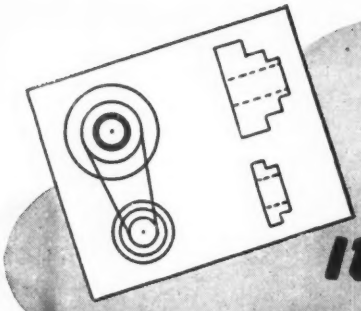

IDEAS FROM READERS

An Interesting Drill Jig for a Saw Housing

By Robert Mawson

A MANUFACTURER of a workshop saw uses an interesting drill jig for drilling and reaming a number of holes in cast iron saw housings. A saw housing is shown in Fig. 1; and, as may be seen, seven holes are machined in it. The drill jig is shown in Fig. 2.

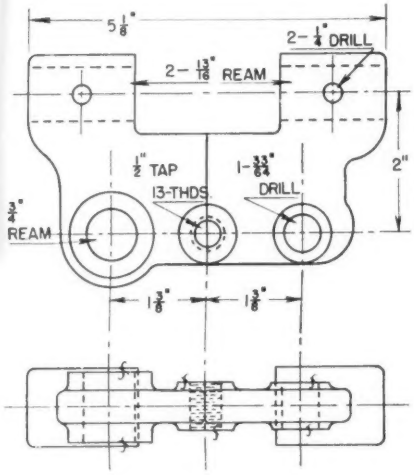

Fig. 1—A saw housing for which the drill jig shown in Fig. 2 was designed.

This drill jig is made with a cast iron, box-type frame, **A**, to which is fastened, by means of screws and a dowel pin, a drill bushing plate, **B**. Five bushings are pressed into plate **B** through which the tools are guided for drilling five corresponding holes in the part. Four supporting feet, **C**, are located on the under surface of the drill bushing plate; and four similar feet are placed on the top surface of the frame.

A double ended V-block, **D**, is located at the rear of the jig in which the bosses at the rear of the saw housing are placed for machining. It may be noticed that the block is notched at each end so that the two $\frac{1}{4}$-inch holes in the housing may be drilled without interference. In the center of **D**, there is a projecting portion, **E**, which fits into the open space between the bosses of the housing; and a $\frac{5}{8}$-inch steel bushing is positioned in projection **E** so that its centerline is in line with the centerlines of the holes to be drilled in the bosses.

A stud, **F**, is screwed into projection **E**; and a hold-down plate, **G**, having two extensions, **H**, is positioned on this stud. Another stud, **I**, is located at the front of the jig which screws into plate **B** and on which is positioned another hold-down plate, **J**. Plate **J** pivots on pin **K** when the nut on stud **I** is removed.

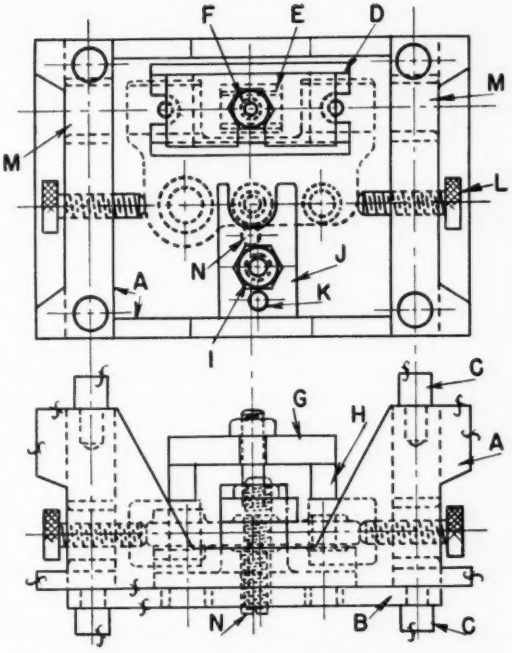

Fig. 2—Drill jig designed for drilling and reaming seven holes in the saw housing shown in Fig. 1.

Two knurl-head screws, **L**, are screwed through the side uprights of the jig; and two one-inch guide bushings, **M**, used to guide the tools for drilling and reaming the boss holes, are pressed into these same uprights. An adjustable screw, **N**, is screwed through bushing plate **B** on which the front housing rests to locate it properly in a horizontal plane.

To use the drill jig, hold-down plates **G** and **J** are removed after removing the nuts from studs **F** and **I**. A saw housing is placed in the jig, the rear bosses resting in the V-block and the front of the housing resting on screw **N**. Screws **L** are then tightened down so that projection **E** is aligned properly with the bosses on the workpiece. When this position is established, the hold-down plates are placed over their studs and the stud nuts are tightened down to hold the work securely.

The jig is then turned over so that it is in the proper position for machining; the jig bushing plate is now on the top of the unit. The following operations are then performed on the housing: two ¼-inch holes are drilled; one 33/64-inch hole is drilled; one ¾-inch hole is drilled and reamed; and one 27/64-inch hole is drilled (this hole is later tapped with ½"—13 threads outside of the jig).

Next, the jig is turned over on one of its sides; and the hole through the housing boss is drilled and reamed. Since the proper functioning of the saw mechanism depends largely upon the accuracy of this hole and the one in line with it in the other boss, special tools are used for the drilling and reaming operations. The drill is made with a 51/64-inch cutting diameter and a one-inch shank to guide the tool through bushing **M**. The reamer has a ⅝-inch pilot which guides the tool through the bushing in projection **E**, a 13/16-inch cutting diameter, and a one inch shank to guide the tool through bushing **M**. The part is then turned over on its opposite side, and the hole in the other boss is drilled and reamed in a similar manner. The design of the special drilling and reaming tools assures proper alignment of the two boss holes.

The machining operations are now completed. The two knurl-head screws, **L**, are unscrewed; the nuts on studs **F** and **I** are unscrewed; hold-down plates **G** and **J** are removed; and then the casting is removed.

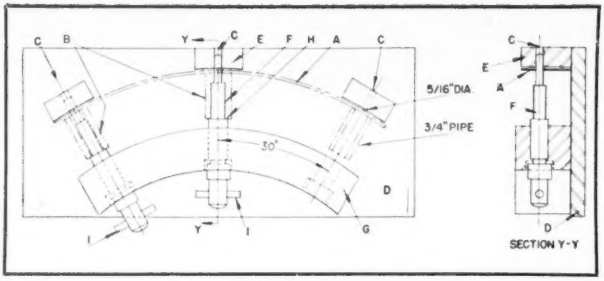

Fig. 1—A simple welding fixture.

A Welding Fixture

By Alex S. Arnott

THE welding fixture shown in Fig. 1 was designed to be used for holding the parts of a workpiece, shown in Fig. 2, during a welding operation. In the fixture is held a sheet metal strip, **A**, to which three pipe spacers, **B**, are welded at angles of 30 deg. The strip **A** is formed to the curvature shown in the illustrations during the previous operation, and three $\frac{5}{16}$ inch holes are drilled in the strip on centerlines **C**. The spacers are made from $\frac{3}{4}$ inch diameter pipe, two inches long; and they are curved on the ends which are welded to the strip.

The fixture consists of a base, **D**, three locators, **E**, three spacer holders, **F**, and a spacer holder guide, **G**. The locators and the guide are welded to the base, and they are bored in line after they are welded to assure a proper alignment of parts. The spacer holders are machined to various diameters—so that they may be fitted into holes in the locators, so that the spacers will fit over them and will be

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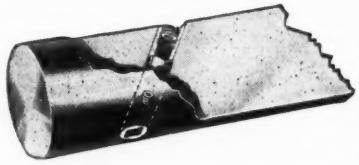

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held by shoulder **H**, so that they have a sliding fit into guide **G**, and so that, at their outer end, they are threaded to fit into a threaded hole in the guide. Pins **I** are inserted through the ends of the holders to aid in turning the holders into position.

In operation, part **A** is placed against the locators **E** in its approximate position. A holder is then inserted through the guide hole; and one spacer is mounted on the holder, being retained by shoulder **H**. The holder is advanced so that the small diameter portion passes through the hole in **A** and into the hole in the locator. The holder is advanced still more, and the threaded portion of the holder is screwed into the threaded hole in the guide until the spacer is held firmly against part **A**. The other two spacers are assembled in position in a similar manner, and then the parts are welded together. One spacer is shown in Fig. 1 without a holder to indicate its position relative to part **A**. After the three spacers are welded, the holders are removed one at a time; and the assembled part is removed from the fixture. The fixture parts are small so that there is no interference during the welding operation.

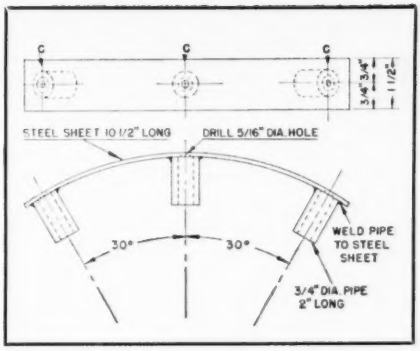

Fig. 2—Workpiece which is located in fixture shown in Fig. 1 for a welding operation.

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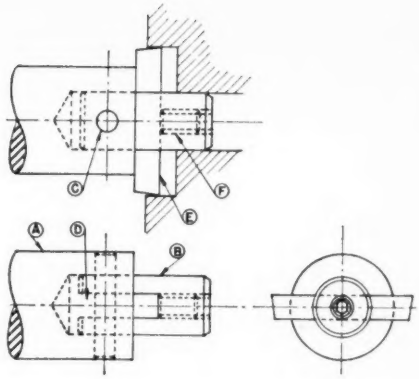
An Inexpensive Counterboring Tool

By Roger Isetts

THE tool shown in the accompanying illustration has proved to be extremely useful for counterboring and spotfacing large holes whose concentricity with smaller holes must be maintained by using guide pilots. The construction of the tool is simple so that few adjustments are required and so that little maintenance is necessary. The tool may also be used as a boring bar, if desired.

The tool consists of a bar, **A**, made of a round section of cold rolled steel of a length and diameter to suit both the job and the machine in which it is to be used. A hole is drilled and reamed in the front end of this bar in which is slipped a round steel pilot, **B**. A smaller hole is reamed through both bar **A** and pilot **B** perpendicular to the pilot hole; and dowel pin **C** is pressed into this hole to hold the pilot in place. A slot, **D**, is milled longitudinally in the guide in which a square tool bit, **E** is placed. The tool bit is held securely by means of a headless set screw, **F**, which is threaded into a hole drilled and tapped along the centerline of the guide.



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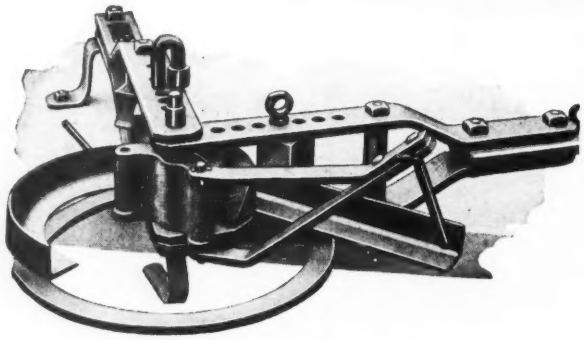

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An Inexpensive Acid Swab

By A. H. Waychoff

AN INEXPENSIVE and long lasting acid swab may be made easily and quickly in the following manner: A short length of manila hemp rope and a shorter length of rubber tubing, in which the rope will fit snugly, are cut; and the rope is inserted into the tubing, as shown at **A** in the accompanying illustration. Approximately one inch of the rope is allowed to protrude, and the strands are then untwisted slightly. This completes the

An inexpensive and long lasting acid swab.

swab. Such a swab is long lasting since the acid does not materially affect the tubing and affects the rope only slightly.

"Case Studies in the Reduction of Metal-Working Costs" is the title of a 24-page booklet published by The Hydraulic Press Mfg. Co., 1048 Marion Rd., Mt. Gilead, Ohio. Seventeen different case studies, made in some of the country's foremost metal-working plants, are recorded. These embrace a wide variety of production problems, and their solution, on such products as home appliances, motorcycles, agricultural machinery, kitchenware, burial vaults, silverware, road machinery, and so on

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Jig Grinder. A four-page folder distributed by the Hauser Machine Tool Corp., Dept. MMS, Manhasset, N. Y., fully illustrates and describes the Hauser Model 3S Swiss Jig Grinder with maximum grinding diameter capacity of 5 inches.

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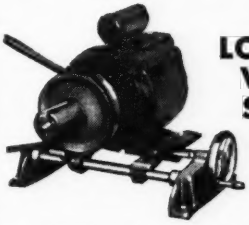

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For fractional h.p. drives. Full contact all pitch diameters. Balanced against noise and vibration.

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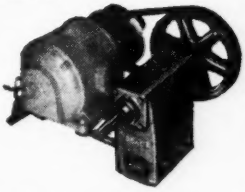

1 to 8 h.p.
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Wide V-Belts and Wide V-Belt Sheaves make this counter shaft unit available as complete drive.

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(not shown) for wide driven speed ranges. Fractional to 1 h.p. Also Wide V-Belt Sheaves, Wide V-Belts, and Adjustable Motor Bases. Deliveries from stock.

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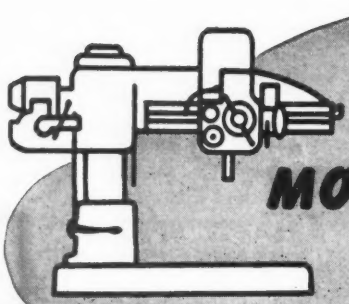


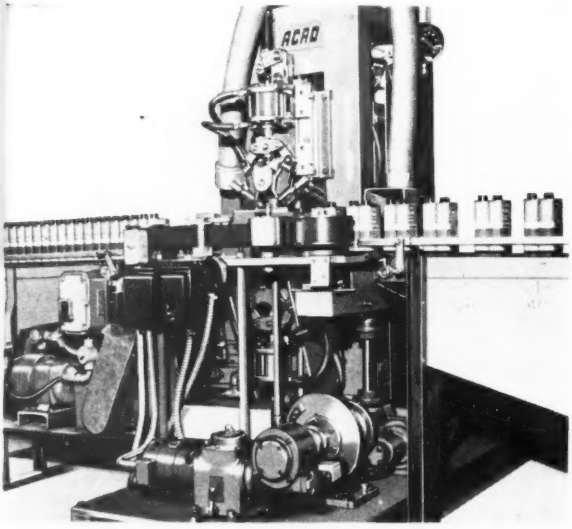
MODERN EQUIPMENT AT WORK

New Spot Welding Units Twin Cans at Rate of 160 Cans per Minute

IN PLANNING a large promotional program for introducing one of its self-polishing waxes, the S. C. Johnson & Son, Inc., makers of Johnson's Wax, wanted to find a new and better method for twinning the cans of wax. The wax was to be sold on a two-for-one basis, and the company felt that the existing methods for joining pairs of cans were not satisfactory.

The company sought a method of twinning the cans which would join the pairs of cans automatically at a high rate of speed; which could be synchronized with the can filling, capping and packaging production lines in the plant; which would assure that the cans remain joined during all handling and shipping operations and yet one which would permit the housewife to snap two cans apart without exerting herself; a method which would not cause the lithographed can surfaces to become soiled or obscured when the cans were joined; and one which would assure no metal tearing, can distortion, or leakage when the cans were snapped apart.

It was finally decided to twin the cans by using resistance welding methods, and the Acro Welder Mfg.



One of three Acromatic units being used by Johnson for twinning cans of wax.

Co. of Milwaukee was selected to provide the welding equipment. Three Acromatic spot welding machines were designed and built for the job, and they have proved to be satisfactory in every respect. The machines, which are completely automatic, are placed along the production lines and take single cans from the standard conveyor and return paired cans to the conveyor at the rate of 160 cans per minute. By means of two spot welding heads, spot welds are produced at the top and bottom rims of each pair of cans where the rims contact each other.

Because the high-speed continuous production requirements eliminated the possibility of using standard feeding, positioning, and ejecting methods, new mechanisms were designed and incorporated into the machines to provide continuous straight line motion for the cans. In the operation, two single cans are taken from the conveyor, positioned momentarily during a short weld sequence, and then ejected automatically as a pair to the conveyor as another pair of single cans is readied for spot welding. One of the installations may be seen in the accompanying illustration.

Relationships between heat, weld time, weld pressure, weld area, electrode shape, and electrode cooling were studied by Acro Engineers in order to eliminate the difficulties arising from the inherent tendency toward electrode pick-up from the electrolytic tin plate can rims. It was found that an average of 14,000 consecutive welds could be made in continuous production before it was necessary to either dress or replace electrodes.

Several million cans have been paired by the three machines in this first promotional program, and it may be said that the "machines have already paid for themselves." In analyzing the costs, it was found that the

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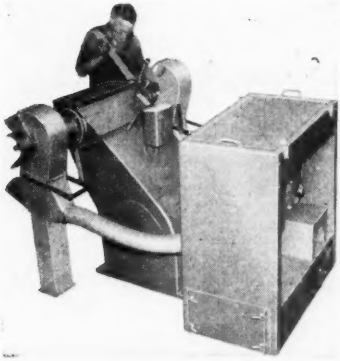
Low Cost, Efficient, Compact. For recirculating cleaned air or for outside exhaust (toxic or objectionable fumes). Twelve models (314 to 3600 cfm), to collect dust from: grinding, buffing, polishing, sanding, wire brushing, bagging, blast cleaning, trimming, woodworking, etc.

Model 1150—1400 cfm—always the best choice for Hammond VRO Polisher.



For recommendation by return mail, describe dust problem. No obligation.

New Catalog 605 now ready.

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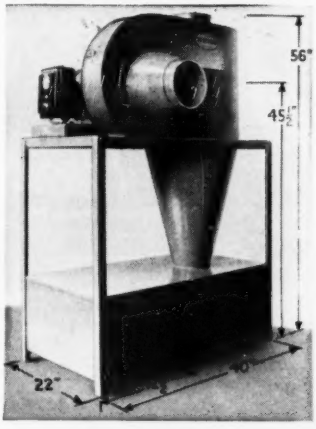
Model 20N30—2300 cfm—exhausts cleaned air outdoors.



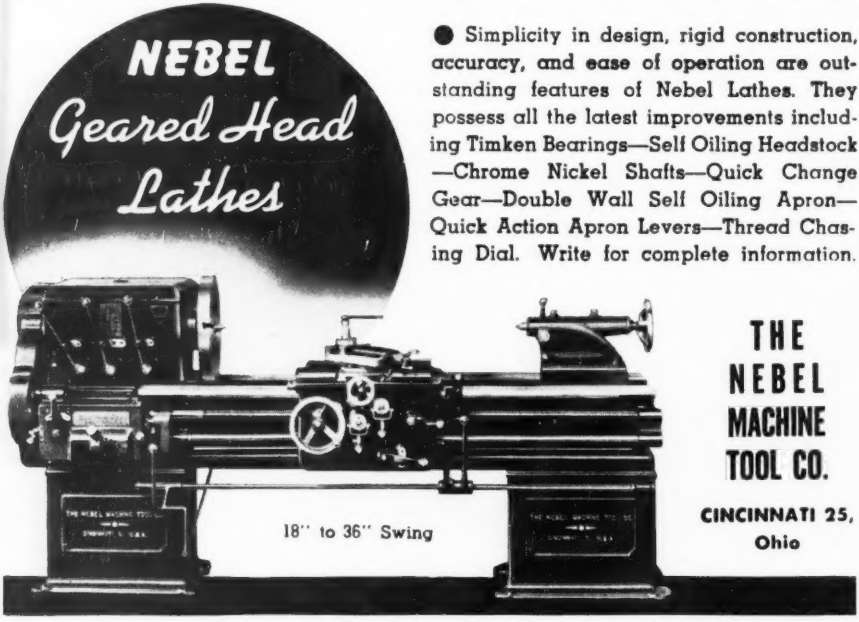
cost of this equipment was no greater than either the cost of labor alone or the cost of material alone which would have been required if the older methods of twinning were used.

Worm Gear Jacks Used in Flame Beveling Operation

ONE OF THE operations in the manufacture of metal tanks is that of beveling the mating edges of the sheets which form the tanks before the sheets are welded. The method of flame beveling is used extensively for this beveling operation, the metal sheets being rolled to a round shape and placed in a horizontal position and the flame beveling machine being aimed at the joining edges. Since the angle at which the flame is applied to the work should remain constant, one of the problems which is presented when using this method is that of adjusting for different tank diameters and, therefore, for different heights.

In the plant of one large manufacturer, the procedure followed in the past was to raise or lower the different sizes of tanks in front of a flame beveling unit which was mounted on a stationary frame. This raising or lowering of the tanks was not only laborious and costly, but it was necessary for the operator to be particularly skillful in order to assure consistently good results. A study was made in attempting to improve the operation, and it was decided that better results could be obtained if the tanks were to remain stationary and the beveling machine were made vertically mobile.

The investigation was made in cooperation with engineers of The Duff-Norton Co. of Pittsburgh, manufacturers of lifting equipment, and it was found that by mounting the flame beveling machine on a frame controlled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Lathes
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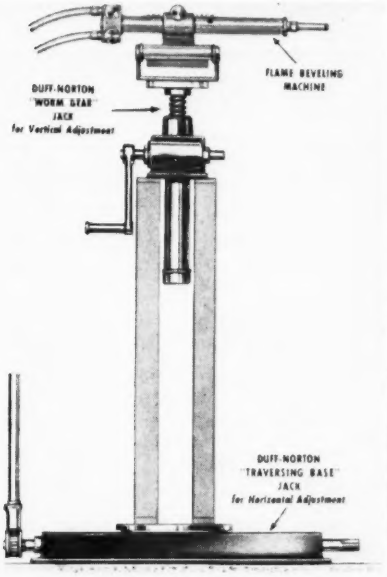
by three vertically-positioned worm gear jacks, the beveling machine could be raised or lowered quickly to the desired level. Three traversing base jacks were mounted at the bottom of the frame in order to permit horizontal movement. In addition, final and more minute adjustment was obtained by

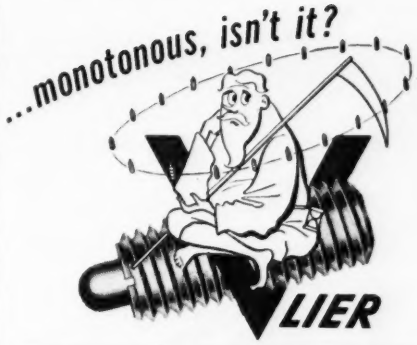

FLAME BEVELING MACHINE
DUFF-NORTON WORM GEAR JACK for Vertical Adjustment
DUFF-NORTON TRAVERSING BASE JACK for Horizontal Adjustment

Arrangement of flame beveling machine used for beveling tank edges.

positioning the tanks between two traversing bases. A diagram of the Duff-Norton installation may be seen in the accompanying illustration. This new method of flame beveling tank edges has proved to be easier, and results have been far more exact than with previous methods.

Stress Relieving Furnace

THE accompanying illustration shows a large, oil fired, recirculating type car bottom furnace which has



SPRING PLUNGERS

...do the same job year in and year out without variation, change or attention...

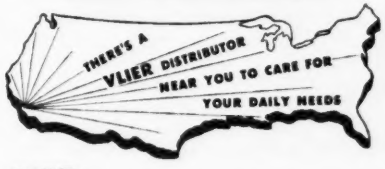
The use of Vlier Spring Plungers eliminates the necessity of spending time and effort in devising and building temporary or makeshift tension holders. These unitized "mighty midgets of industry" fulfill accurate spring tension plunger action for holding and positioning work on die, jig or fixtures more efficiently at a saving of 80% on makeshift Tool costs — and will provide accurate action indefinitely.

Offered in many sizes with end pressures from 5 to 42 lbs., will fulfill every requirement. Accepted as standard by leading industrial plants. Body is threaded with standard N. C. Class 1 threads for easy mounting in fixture walls Hardened, round-nosed plunger telescopes completely within body against spring which maintains tight, positive end pressure. Slotted at plunger end for adjustment, top or bottom. Rust-proofed. Individually boxed. Packed 12 boxes to carton.

VLIER SPRING STOPS

Case-hardened steel plunger with radiused nose providing 14 lbs. holding tension, set in flanged cast iron body which is jig-drilled for bolting to fixture base where no wall sections are available for mountings. Rust proofed. 6 to a box.

New Distribution



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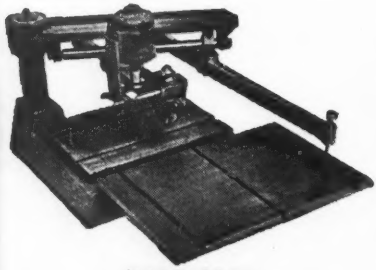

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Engraves an area 5 by 5 inches on curved surfaces without special templates, with smooth lines in any design, number, letter; on iron, brass, copper, aluminum, soft steels and all plastics. • Drills a series of holes • Profiles small parts • Increases accuracy and production • Works from original drawing or templates • Etches glass and similar items • Will not cause distortion. For information and prices write Dept. M.

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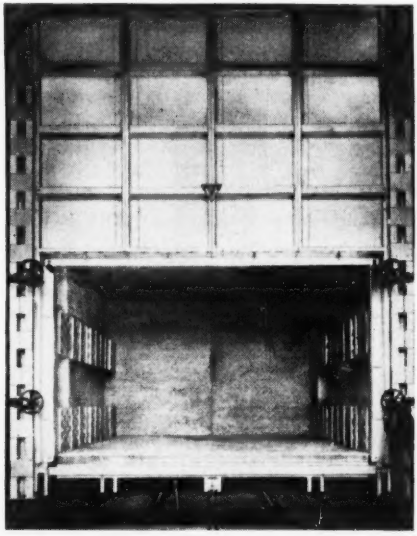
Florida Hill Rd., Ridgefield, Conn.

been installed at the Bath Iron Works, Bath, Maine, for the purpose of solution heat treating and stress relieving gun foundations and for stress relieving steel weldments and high pressure piping. The unit, which was manufactured by the Despatch Oven Co. of Minneapolis, Minnesota, is designed to assure close temperature control and to provide a maximum temperature of



Electrically operated lift door is raised to its topmost position in order to show the working chamber of the large stress relieving furnace.

1350 deg. F. The work chamber dimensions are 18 feet wide by 25 feet long by 12 feet high.

As may be seen, tracks are provided in the floor on which the furnace bottom may be moved in order to facilitate loading and unloading of work. The bottom, which is provided with special heat sealing edges, is moved by means of an electric car pull at the rate of 20 feet per minute. The lift door at the front of the furnace is electrically operated; and, during loading and unloading, it is raised just enough to

clear the work in order to assure a minimum heat loss.

Two 3,000,000 B.t.u. per hour oil heaters are used to supply heat to the unit, and special high volume fans are employed for the purpose of maintaining a uniform temperature throughout the work chamber. The capacity of the furnace for stress relieving steel weldments and high pressure piping is 12,000 lb. Automatic temperature controls and suitable safety equipment are incorporated into the unit.

Copper-Steel Bimetallic Washer Used in New Fishing Reels

A NEW bimetallic inductor washer disc of solidly bonded copper and steel is now being manufactured by the Laminated Shim Co., of Glenbrook, Connecticut, for use in the automatic brakes of two, new, independently developed fishing reels which are said to eliminate back lash in casting. The reels are manufactured by the Horton Manufacturing Co. of Bristol, Connecticut (reels produced for fresh water use), and by Ocean City Manufacturing Co. of Philadelphia, Pennsylvania (reels produced for salt water use).

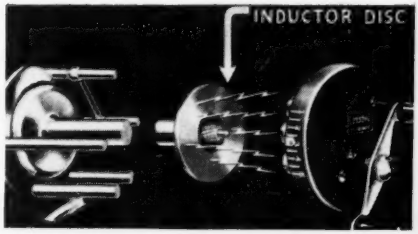
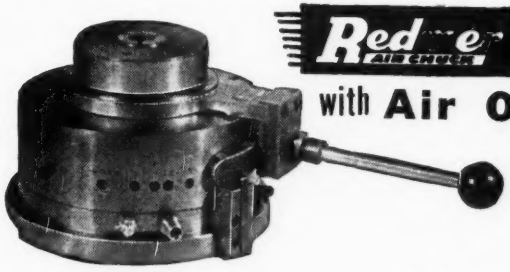


Illustration shows inductor washer disc used in a new fishing reel.

Sheets of .20 inch copper and .004 inch steel are bonded metallically by a



Redmer AIR CHUCK

Index Chuck with Air Operated Collet

The REDMER INDEX CHUCK has twelve indexing positions and Collet capacity 1/16" to 2". REDMER CHUCK can be had with either Index Collets or Standard Brown & Sharpe type collets.

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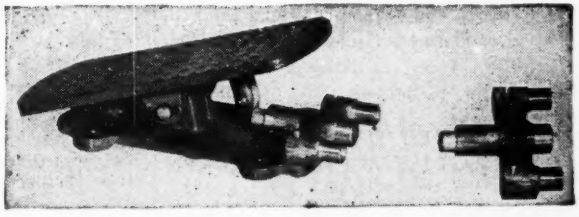
The REDMER FOOT CONTROL AND VALVE was developed in order to meet a demand for an AIR VALVE & FOOT CONTROL LOW IN Cost but constructed to surpass the high priced Valves.



REDMER AIR DEVICES CORP.

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SURFACE PLATES • BOX PARALLELS
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patented process, and washers are then stamped out to a tolerance of plus or minus .001 inch on the diameters. Concentricity is maintained within .001 inch.

Though not truly a bimetal in the ordinary sense, users of bimetals and designers facing similar problems of design and material will be interested in the development of the washer disc. The braking action of one new fishing reel is cited for an example and illustrated herewith. The smooth casting action of the reel is brought about by the use of three General Electric Sintered Alnico permanent magnets which are mounted on a non-magnetic plate having an adjustable air gap. The bimetallic disc is mounted on the end of a spool, and the disc cuts the lines of force of the permanent magnets. The eddy currents induced by rotation set up electromagnetic poles in the disc which repel the permanent magnetic poles and produce a drag on the speed of the spool. Since the strength of the electromagnetic poles depends upon the speed of rotation of the spool, this automatic braking effect is always applied in just the right amount.

Induction Heating Unit, which is said to be capable of supplying 25 kw. at approximately 450,000 cycles per second for heating metals and other electrical conducting materials, is illustrated and described in Bulletin T-1420 available from the High Frequency Division, Lindberg Engineering Co., 2469 W. Hubbard St., Chicago 12, Illinois.

"Heat Treating and Pickling of Armco Stainless Steels" is the title of a 36-page booklet published by the Armco Steel Corp., 3949 Curtis St., Middletown, Ohio. Subjects discussed are general practices and equipment for heat treating stainless; recommended heat treatments for the chromium-nickel, ferritic chromium, and martensitic chromium (hardenable) types of stainless steel; surface hardening; pickling (scale removal) methods; and heat-treating problems and remedies.

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Cost-Cutting Methods to Feature Technical Sessions at ASTE Semi-Annual Meeting

DETAILS of the program for its 17th semi-annual meeting announced by the American Society of Tool Engineers reveal that it will be featured by one of the most extensive technical programs in the Society's history.

Scheduled for the Mount Royal Hotel in Montreal, October 27th through 29th, the three-day program provides for nine technical sessions—three on Thursday, five on Friday and one on Saturday.

The majority of the sessions deal primarily with methods by which tool engineers can reduce costs. Cost cutting with tools, cutting costs on dies, cost cutting with machines, estimating and economics of cost cutting are among the major subjects to be tackled at individual sessions.

Opening the program officially on Thursday, October 27th, will be a welcoming luncheon at which Camillien Houde, Mayor of Montreal will welcome members to the city. Technical sessions begin at 2:00 P.M. with Islyn Thomas, President, Thomas Mfg. Corp., and Edmund W. Spitzig, Hobbing Supervisor, Newark Die Company, both of Newark, N. J., will discuss "Mold Die Hobbing" followed by a paper on "Mold Die Finishing" presented by M. C. Overholt, General Superintendent, Peerless Engineering, Ltd., Toronto, Ontario.

Also at 2:00 P.M. Thursday, W. Arthur Thomas, Supt. of Tool Engineering, Ford Motor Company of Canada, Ltd., Windsor, will discuss "Application of Standard Tool Parts to Cut Costs."

Thursday evening is devoted to a session on "A New Concept of Surface Measurement," with two papers. "Surface Finish Control and the Making of Master Standards" will be handled by Arthur F. Underwood and Roy P. Trowbridge, of the General Motors Research Laboratories, Mechanical Engineering Division, Detroit. Dr. Clayton R. Lewis, Staff Research Engineer, Chrysler Corporation, Detroit, Mich., will follow with a paper on "Calibration of Master Roughness Standards and Their Use."

Five Sessions Friday

"Use of Low Melting Point Alloy for Tool and Die Work" will be the subject of a paper Friday morning by Carleton H. Smith, Branch Manager, Canada Metal Co., Ltd., Montreal, at the same time that Edgar L. Barker, President, Modern Tool Works, Ltd., Toronto, is discussing "Special Purpose Machines from Standard Units" at another session.

"Estimating and Economics of Low Cost Tooling" is the topic of one of Friday afternoon's sessions, with two papers on "Predesign Estimating" and "Postdesign Estimating," presented respectively by G. M. Foster, Asst. Supt. of Mfg. Engineering, and George S. Clarke, Asst. Supt. Machine and Tool Mfg., of the Telephone Division of Northern Electric Co., Ltd., of Montreal.

"Limited Production" Symposium

A symposium on all the factors relating to lowering costs in "Limited Production," is also scheduled for Friday afternoon. "Economics of Limited Production," will be handled by E. P. Blanchard, General Sales Manager, The Bullard Company, Bridgeport, Conn., "Tools and Materials for Limited Production" has been assigned to J. B. Savits, Methods Manager, Pneumatic Scale Corp., Ltd., North Quincy, Mass., with a third paper on "Quality

Control of Limited Production to be presented by C. D. Wright, Chief Engineer, Reliable Toy Co., Ltd., Toronto.

Friday evening's session will be devoted to various phases of 'Hot Machining.' J. R. Roubik of Kearney & Trecker and Marquette University, Milwaukee, will talk on "Milling Hot Workpieces," while "Hot Spot Machining" will be covered by Sam Tour, Chairman of the Board, Sam Tour & Co., Inc., New York.

Saturday morning's session is devoted to the subject of "Statistical Quality Control," featuring a paper by John K. MacKeigan, Chief Inspector, Tire Division, Dunlop Tire and Rubber Goods Co., Ltd., Toronto.

Plant Visits

Numerous plant visits have been scheduled in the neighborhood of Montreal to permit visiting tool engineers to inspect methods by which Canadian industry has raised itself from eighth to fourth place in industrial output in the world. Plants at which visits have been arranged include Canadian Car and Foundry Co., Ltd.; Canadian Vickers, Ltd.; Dominion Engineering Works, Ltd.; Telephone Division and Wire and Cable Division of Northern Electric Company, Ltd.; RCA Victor, Ltd.; Canadair, Ltd.; Canadian Pacific Railway Co., Angus Shops; and Montreal Locomotive Works, Ltd.

Clarence D. Howe, Banquet Speaker

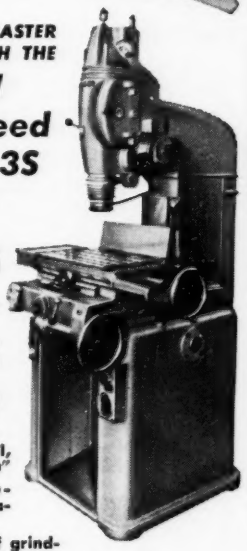
Canada's Minister of Trade and Commerce, and also of Supply and Reconstruction, the Honorable Clarence D. Howe, will be the guest speaker at the semi-annual dinner Saturday evening, speaking on "Industrial Canada —Today and Tomorrow."

An extensive ladies' program has also been developed for the three day meeting including special scenic motion pictures, a motor tour through the Laurentian Mountains, visits to interesting local industries, a fashion show, and so forth.

PRECISION JIG GRINDING

DO YOUR JOB FASTER ...BETTER...WITH THE

NEW High Speed Hauser 3S



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★Maximum grinding spindle speed —75,000 R.P.M.

★Maximum grinding diameter—5"

★Accuracy of reading on measuring slides—.0001"

★Table working surface--22x12¾"

★Travel of table slides: Longitudinal, 16"; Transverse, 10"

★Guaranteed accuracy of slide locations—.00015"

★Vertical travel of grinding spindle—3-9/16"

★Taper grinding up to 3 degrees

Here is a Swiss precision jig grinder combining the highest accuracy with exceptional output capacity. Incorporating the latest in engineering design, it is protected throughout against grinding dust and grit . . . giving years of hard use without readjustment to ways and slides. All controls are within easy reach of operator, even while seated!

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Write or wire for descriptive literature on this model 3S cylindrical and tapered-bore grinder . . . and for other Hauser products.

HAUSER DIVISION

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MACHINE TOOL CORP.

MANHASSET, N. Y.

News of the Industry

John F. Miller to Head Tool Division of Illinois Tool Works

Harold Byron Smith, president of Illinois Tool Works, Chicago, has announced the appointment of John F Miller as manager of the company's Tool Division. A graduate of the University of Michigan, Mr. Miller began his business career in 1929 with the Ex-Cell-O Corporation, Detroit, and recently resigned the position of sales manager of the Machine Tool and Cutting Tool Division of that company. Mr. Miller served with the tool division of the War Production Board, has been active in trade association work and is well known throughout the metal-working industry.

John F. Miller

As manager of the Tool Division of Illinois Tool Works, Mr. Miller will direct the engineering, manufacturing and sales of standard and special metal-cutting tools and machines produced by the company.

S.A.M. 1949 Fall Training Conference

Reduction in costs through the utilization of new developments and principles of industrial engineering will be the keynote of the 1949 Fall Training Conference to be held under the auspices of the Chicago Chapter of the Society for the Advancement of Management on Thursday, October 13 and Friday, October 14 at the Illinois Institute of Technology.

Management men of the midwest region attending the conference will receive intensive training. Two sessions will be held each day. Each of the four sessions will be under the guidance of an outstanding engineer who will be lecturing on his field of specialization. Harold B. Maynard, president of the Methods Engineering Council, Pittsburgh, will lecture and direct training on recent developments in Methods Improvement and Work Measurement. The session on Standard Elemental Data will be directed by Phil Carroll, Jr., author and lecturer on time study. Allan H. Mogensen, widely known New York industrial consultant, will guide the session on Work Simplification. E. A. Cyrol, staff engineer with A. T. Kearney & Company, will direct the Wage Incentive phase of the conference.

Reservations may be made by addressing the conference chairman, H. A. Mercer, at Sterling Tool Products Co., 2085 N. Hawthorne Ave., Melrose Park, Ill. The fee is $15.00 for members of the S.A.M. and $30.00 for non-members.

A.M.T.D.A. 25th Anniversary Banquet

Senator Robert A. Taft of Ohio will be the speaker at the 25th Anniversary Banquet of the American Machine Tool Distributors' Association which will be held Monday evening, October 31 in the Roof Garden of the Hotel Gibson, Cincinnati, Ohio. A. G. Bryant, president of Bryant Machinery and Engineering Company and a past president of the Distributors' Association, will act as toastmaster. President Robert L. Giebel of Giebel, Inc., New York City, will introduce Mr. Bryant, following which individual certificates will be presented to the representatives of the 23 founder companies who are still actively engaged in the business.

All persons attending the banquet will also be extended an invitation to attend the Tuesday morning, November 1 session, which will provide a program of general interest. Speakers at this session will be Fred C. Dennis, partner of Lybrand, Ross Bros. and Montgomery, who will talk on "How to Read Your Customers' Financial Statements"; William K. Beard, vice president of McGraw-Hill Publishing Company, who will have as his subject "Advertising"; and William A. A. Castellini, vice president of Dinerman & Company, public relations counsel, who will speak on "Public Relations."

National Safety Congress and Exposition

Talks by important business leaders in some of America's largest companies will highlight the program of the 37th Annual Convention of the National Safety Council to be held in Chicago, October 24-28. Persons attending the congress will hear such speakers as Gustav Metzman, president of the New York Central System; James Tanham, vice president for industrial and public relations of the Texas Company and chairman of the board of directors of the National Safety Council; James E. Trainer, vice president of Firestone Tire and Rubber Company; Earl E. Moore, vice president for industrial relations of Carnegie-Illinois Steel Corporation; Dr. Andrew C. Ivy, vice president of the University of Illinois medical schools; Maj. Gen. Philip B. Fleming, chairman of the U. S. Maritime Commission; and many others.

A feature of the congress will be a labor-management safety symposium on what can be done by labor organizations and industry to reduce off-the-job accidents. There will be more than 200 congress sessions on all phases of safety, and more than 500 program participants will take part in discussions. A display of radiological protective equipment by the Oak Ridge National Laboratory of the U. S. Atomic Energy Commission will be part of the industrial exposition to be held in the Stevens Hotel.

Did You Know?---

The Butterfield Division of Union Twist Drill Co., Derby Line, Vt., manufacturer of taps, dies, reamers, and special cutting tools, has appointed the **Bond Supply Company** as distributor in Kalamazoo and Battle Creek, Mich. Bond maintains stores at 54 Barney St., Battle Creek and 524 N. Rose St., Kalamazoo.

The Whiton Machine Co., New London, Conn., has appointed the following new exclusive representatives: **Screw Machine Tool & Supply Co.,** 2400 W. Clybourn St., Milwaukee 3, Wis., to handle lathe chucks in the State of Wisconsin; **Pacific Coast Tool Co.,** 1711 Webster St., Oakland 12, Calif., to handle lathe chucks, centering machines, special purpose milling machines, and gear cutting machines in northern California; and **Woodell Engineering & Sales Co.,** Dayton, Ohio, to handle lathe chucks, centering machines, special purpose milling machines, and gear cutting machines in southern Ohio.

Save Up To 85% of Weld Cleaning Labor—Unretouched photo shows how quick weld spatter "comes clean" when you paint or spray Protect-O-Metal No. 2 before welding. No profit-wasting work with air chisels, wire brushing, or sand blasting. Get smooth, clean surfaces. Unlike all other "spatter-proofing" compounds, Protect-O-Metal No. 2 will not cause smoke, fumes or odors. One coat serves all needs, costs about 1/10¢ per foot of weld, saves up to three times its cost in time savings alone. Order a Trial Gallon ($3.15) for testing. Your money back if compound does not prove entirely satisfactory.

PROTECT-O-METAL No. 2

G. W. Smith & Sons, Inc.
5407 Kemp Road, Dayton 2, Ohio

OK. Send me a trial gallon. I understand you will cancel the invoice if I'm not entirely satisfied.

*Name*_____

*Firm*_____

*Address*_____

Did You Know?---

The Whiton Machine Co., New London, Conn., has opened an office at 310 S. Michigan Ave., Chicago, Ill., where **Vincent T. Peterson,** factory representative, will be in charge of sales for lathe chucks, centering machines, special purpose milling machines, and gear cutting machines in Indiana, Illinois, Michigan, and Wisconsin.

Harold F. Welch has resigned as machinery manager of Pratt & Whitney's New York branch office located at 117 Liberty St., New York City. He is succeeded by **Isham Keith,** who has been with Pratt & Whitney for 20 years in sales engineering work in the New York territory, as well as in the Rochester and Milwaukee districts.

Wells Manufacturing Corp., Three Rivers, Mich., has appointed three men to executive positions in the engineering department: **Martin J. Verhuel** to chief product engineer, Meat Saw Division; **Erwin Tobler** to chief product engineer, Metal Saw Division and **David T. Evans** to research engineer for both divisions. **W. F. Wells,** formerly vice president in charge of engineering, has severed his connections with the company.

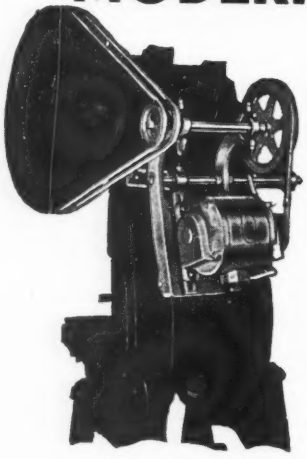
The George Worthington Co., 802 St. Clair, N. W., Cleveland 13, Ohio, has been appointed distributor for Cleveland and vicinity for the line of screw thread cutting machinery and tools manufactured by The Geometric Tool Co., New Haven 15, Connecticut.

The Landis Tool Co., Waynesboro, Pa., manufacturer of precision cylindrical grinders, has appointed the **C. F. Bulotti Co.,** 475 4th St., San Francisco, as exclusive distributor for northern California and western Nevada, and the **Lang Co.,** Box 479, Salt Lake City, Utah, as exclusive distributor for the State of Utah and surrounding portions of Idaho, Wyoming, and Nevada.

The **Perfection Gear Co.,** Harvey, Ill., has purchased the American Stock Gear Co., Chicago, and will operate it as the American Stock Gear Division of Perfection Gear Company, with all operations centered at the plant located at 152nd St., & Vincennes Ave., Harvey.

Phillips Bros. Screw Products Co., manufacturer of automatic screw and allied machine products and universal indicator holders, has moved to new and enlarged quarters at 2909 S. Logan St., Lansing 15B, Michigan.

MODERN MOTOR DRIVE



Puts the "PUNCH" in Punch Presses

Utilize standard 1750 RPM motors.

No need to use slow speed or geared motors and small pulleys to slowdown your presses.

"V" Belt Drive absorbs shock — operate smoothly — silently — efficiently — economically.

We invite your communications

• • •

MODERN MOTOR DRIVES DIVISION of
The Nichols Engineering Co. 2400 W. Madison St., Chicago 12, Ill.

Did You Know?---

Hauser Machine Tool Corp., Manhasset, N. Y., has been appointed exclusive U. S. factory representative for the entire line of high speed precision automatic screw machines, precision wood screw machines, cam shaping machines, and accessory cam-making equipment produced by Tornos Works, Ltd., Moutier, Switzerland.

Dr. Martin H. Hœrin, for many years director of research for the Armour Research Foundation of the Illinois Institute of Technology, has been named director of applied research for the Industrial Products Division, Elgin National Watch Co., Aurora, Illinois.

Headquarters of **The Resistance Welding Institute,** clearing house for information on the resistance welding processes, have been moved to the Hartman Bldg., Detroit Ave. at Warren Rd., Cleveland 7, Ohio.

Dr. Eugen Sovegjarto, welding alloys research expert formerly employed by leading metallurgical concerns in Germany, has joined the research staff of the Eutectic Welding Alloys Corp., 40 Worth St., New York 13, New York.

George E. Dresser, manager of hardware-automotive sales for The Carborundum Co., Niagara Falls, N. Y., has retired after 42 years of service on the company's sales force, and is succeeded by **Charles W. Sprenger,** formerly manager of Carborundum's New York office and more recently assistant manager of hardware-automotive sales. **L. P. Mercer,** formerly manager of the company's sales training department, has been selected as assistant manager of hardware-automotive sales.

Walter M. Reynolds has been elected secretary of the Morse Chain Co., a division of Borg-Warner Corp. Mr. Reynolds also retains his post as controller of the division, which operates plants in Detroit, Ithaca, N. Y., and England. The duties of treasurer of Morse Chain have been assumed by **R. P. Johnson,** the first vice president.

W. S. Ehrenfeld Co., 531 W. King St., York, Pa., has been appointed as authorized distributor in York and the surrounding territory for the line of standard tools and blanks, carbide-tipped masonry drills, and diamond impregnated carbide wheel dressers produced by the Carboloy Co., Inc., Detroit, Michigan.

Dependable **MEASURING & CHECKING EQUIPMENT**

and Now

HAND WHEELS, KNOBS, HANDLES

Cadmium Plated READY TO DELIVER

Non-rusting — good looking

STRAIGHT and OFFSET TYPE

SOLID ROTARY MACHINE HANDLES

CAST IRON

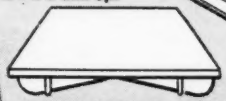
MALLEABLE IRON

We also build jigs, fixtures, special tools and machinery. Send us your blueprints.

UNIVERSAL ANGLES
In 10 sizes, ranging from 4 x 3¾ x 5 and up.

BOX PARALLELS
In 15 sizes, ranging from 3 x 4 x 12 and up.

SLOTTED ANGLES
In 19 sizes, ranging from 4 x 9 x 5 and up.



SURFACE PLATES
Over 50 sizes, ranging from 7 x 7½ to 96 x 192.

Send for Complete Catalog

MACHINE PRODUCTS CORPORATION

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Buy KIPP AIR GRINDERS Because

The RPM's stay up while grinding... not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind — not just rub. The speed of Kipp air grinders drops but slightly when put to work. That means better work — longer wheel life.

Buy Kipp air tools for best results, lower prices.

MODEL JA
50,000 R. P. M.
$42.00
IN U. S. A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

MADISON-KIPP CORP.
208 Waubesa St., Madison, Wis., U.S.A.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Really High Speed* AIR TOOLS

Did You Know?---

Walter H. Wiewel has been appointed vice president in charge of sales of the Crucible Steel Company of America, New York 17, N. Y. Mr. Wiewel, who retains his present post as president of the Crucible subsidiary, Trent Tube Co., East Troy, Wis., has also been elected to the Crucible board of directors and will head all sales activities of Crucible and Trent, with headquarters in Pittsburgh.

Tool Supply & Engineering Co., 1901-1903 Canton St., Dallas 1, Texas, has been appointed an authorized distributor in Dallas and the northern Texas territory for the line of standard tools and blanks, carbide-tipped masonry drills, and diamond impregnated carbide wheel dressers produced by the Carboloy Co., Inc., Detroit 32, Michigan.

The Carlyle Johnson Machine Co., Manchester, Conn., manufacturer of the "Maxitorq" clutch for machine tools, hoists, lift trucks, and so on, has appointed **Bourke & Mabee,** Harbour Commission Bldg., Toronto 1, Ontario, as sales representative for all of Ontario.

B. C. Ames Co., Waltham, Mass., manufacturer of micrometer dial indicators and micrometer dial gages, has appointed the **E. L. Sandberg Co.**, 930 Pillsbury Bldg., Minneapolis 2, Minn., as exclusive sales representative in the State of Minnesota and western Wisconsin.

The **W. P. & R. S. Mars Co.**, 322-324 W. Michigan St., Duluth, Minn., has been appointed distributor by Ampco Metal, Inc., Milwaukee, Wis., for its complete line of welding electrodes in northern Minnesota, upper peninsula of Michigan, and the northern counties of Wisconsin.

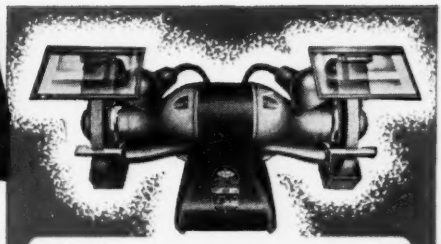
C. R. Harmon has been appointed sales manager of the Carbide Sales Division, Firth Sterling Steel & Carbide Corp., McKeesport, Pa. **J. M. Stokes** has been appointed sales manager of the division.

Gilbert W. Chapman has been elected president of The Yale & Towne Mfg. Company, succeeding **Calvert Carey** as the sixth president of the 81-year old lock and materials handling equipment firm.

James L. Byrom, manager of the Chandler-Evans Division of Niles-Bement-Pond Company, has been elected a vice president of N-B-P.

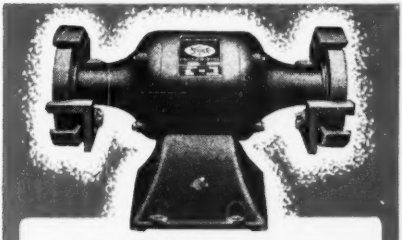
J. J. Sowko has been named Pittsburgh branch sales manager for the Firth Sterling Steel & Carbide Corp., McKeesport, Pennsylvania.

Equip for Long Faithful Service with SIOUX BENCH GRINDERS



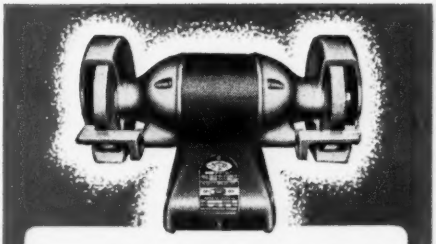
SIOUX 10" BENCH GRINDER

No. 2050-10"—1 H. P. ball bearing motor—oil packed and sealed—no further lubrication. Extra wide enclosed guards accommodate wire brush. Safety eye-shields, adjustable tool rests. Conveniently located lights with shades. One coarse—one fine grinding wheel. Rated 1725 R. P. M. Pedestal available.



SIOUX 6" BENCH GRINDER

No. 2065—1/3 H. P. Ball bearing—packed and sealed. Adjustable tool rests. Rating 3450 R. P. M. One fine—one coarse grinding wheel



SIOUX 6" HEAVY DUTY

No. 2005-6" 1/3 H. P. ball bearing motor. Oil packed and sealed. Enclosed guards. Rated 3450 R. P. M.

SIOUX 6" BENCH GRINDER

No. 2069—1/4 H. P. Ball bearing, permanently lubricated. Adjustable tool rests. Rating 3450 R. P. M.

A SIZE FOR EVERY NEED · Priced to fit your Pocketbook.

• SIOUX grinders are correctly designed, precision machined and carefully assembled to give smooth, steady operation year after year. Oil packed and sealed—ball bearings.

Operators everywhere have a word for QUALITY in power tools—it's SIOUX. Ask your Jobber for details.

Sold only through Authorized SIOUX Distributors

STANDARD THE WORLD OVER

ALBERTSON & CO., INC. SIOUX CITY, IOWA, U. S. A.

Personnel Attending National Machine Tool Builders' Association-American Machine Tool Distributors Association Sales Conference, Dartmouth College, August 8-13, 1949.

(Left to right, first row)—George R. Morin, chief sales engineer, Jones & Lamson Machine Co.; Charles S. Bradeen, vice president, Upton, Bradeen and James; Donald W. Cameron, Personnel Bureau, Dartmouth College; Earl P. Leeds, in charge of milling machine sales, Brown & Sharpe Manufacturing Company; Tell Berna, general manager, National Machine Tool Builders' Assoc.; James C. Herbert, general sales manager, Jones & Lamson Machine Company; Prof. Nathaniel G. Burleigh, industrial management, Tuck School of Business Administration, Dartmouth; Prof. Harry J. Loberg, Dept. of Administrative Engineering, Cornell; Dean William P. Kimball, Thayer School of Engineering, Dartmouth; C. Denson Day, sales manager, Machinery Div., Norton Company; Howard L. Rich, Jr., Lynd-Farquhar Company; Prof. Henry L. Duncombe, Jr., asst. prof. of business statistics, Tuck School, Dartmouth.

(Second row)—E. Guernsey, sales Eng'g. dept., Norton Company; Otto J. Maha, vice president, Hannifin Corporation; F. Steele Blackall, III, Taft-Peirce Mfg. Company; Harold A. Andrew, sales engr., Barnes Drill Company; David W. Wais, eastern sales rep., Carlton Machine Tool Company; Owen C. Stevens, Stedfast & Roulston, Inc.; Lee R. Davis, Stedfast & Roulston, Inc.; Stanley W. Stedfast, secretary, Stedfast & Roulston, Inc.; C. Bruce Price, Stedfast & Roulston, Inc.; Leonard B. Almy, sales engr., Taylor & Fenn Company; F. A. Milnes, E. W. Bliss Company; R. H. McGrath, National Machine Tool Builders' Association; R. Dubois, Rudel Machinery Company, Ltd.

(Third row)—W. H. Hinchliffe, Jones & Lamson Machine Company; H. F Holden, Jones & Lamson Machine Company; M. E. Cooper, Sheffield Corporation; Granville M. Fillmore, Modern Machine Shop; Hugo E. Czerwonky, George Gorton Machine Company; Walter Sceeles, sales & adv. mgr., Abrasive Machine Tool Company; Elmer A. Vehr, Stedfast & Roulston, Inc.; William C. Cook, asst. sec'y., Stedfast & Roulston, Inc.; A. M. Stedfast, Jr., Stedfast & Roulston, Inc.; J. W. Whitaker, Jr., Heald Machine Company; Geo. A. Sherwin, asst. sales mgr., Leland-Gifford Company; Jack Brown, Landis Tool Company; George K. Cassady, sales engr., Giddings & Lewis Machine Tool Co.

(Fourth row)—F. G. Eberhardt, asst. sales mgr., Gould & Eberhardt, Inc.; Ray C. Wing, sales engr., Joseph Monahan, Agent; M. S. Hayes, Rudel Machinery Co., Ltd.; D. Taylor, sales engr., Hydraulic Press Mfg. Co.; D. J. Harshbarger, Monarch Machine Tool Co.; Morton D. Furber, Lynd-Farquhar Co.; Joseph Dumas, sales engr., Taylor & Fenn Co.; J. T. Welch, mgr. mach. tool sales, Sheffield Corp.; L. W. Carruthers, Upton, Bradeen & James, Ltd.; W. D. James, Upton, Bradeen & James Ltd.; H. M. Upton, Upton, Bradeen & James, Ltd.; P. R. Foseid, Gisholt Machine Co.; C. F. Pearson, Secretary, W. E. Shipley Machinery Co.; George E. Smith, Landis Tool Co.

(Fifth row)—Fred Reese, prod, engr., American Tool Works Co.; J. B. Riley, Rudel Machinery Co., Ltd.; Don McConaughy, Rudel Machinery Co., Inc.; W. H. Bennett, gen. sales dept., Hydraulic Press Mfg. Co.; J. D. Sherman, sales rep., Norton Co.; Richard W. Dow, sales engr., Wigglesworth Machinery Co.; Geo. M. Anderson, sales engr., Wigglesworth Machinery Co.; L. L. Peeke, ser. & sales mgr., Giddings & Lewis Machine Tool Co.; T. A. Dillon, Jeffreys Engineering & Equipment Co.; F. W. McQuestion, Chas. G. Allen Co.; G. R. Eldred, eastern dist. mgr., Micromatic Hone Corp., Micro-Mold Mfg. Division; Wm. N. Bennett, eastern sales mgr., Racine Tool & Machine Co.; Raymond C. Springer, Gisholt Machine Co.; N. Douglas Macleod, Jr., Abrasive Machine Tool Co.; John R. Carlson, sales mgr., Heald Machine Co.; Martin L. Copeland, sales engr., Potter & Johnston Co.

(Sixth row)—William Baird, Harrington-Wilson-Brown Co.; H. Rejall, Rudel Machinery Co., Ltd.; John P. Finn, Harrington-Wilson-Brown Co.; Roger A. Staley, Harrington-Wilson-Brown Co.; M. P. Dunn, Henley Machine Co.; A. Douglas Proctor, Harrington-Wilson-Brown Co.; Chas. G. Ellis, dist. mgr., Oilgear Co.; Nichols W. Caldwell, sales engr., Wigglesworth Machinery Co.; G. H. Mortimer, J. H. Ryder Machinery Co., Ltd.; A. W. Shute, J. H. Ryder Machinery Co., Ltd.; G. A. Rogers, Rudel Machinery Co., Ltd.; Neil Van Deusen, V & O Press Mfg. Co.; R. D. MacKenzie, Rudel Machinery Co., Ltd.; Arthur S. Morse, Lynd-Farquhar Co.; C. E. Smith, Pratt & Whitney, Div. Niles-Bement-Pond Co.; John Conlon, Pratt & Whitney, Div. Niles-Bement-Pond Co.

(Seventh row)—Paul Polk, Sheffield Corp.; C. W. Austin, Rudel Machinery Co., Ltd.; C. E. Alling, Bullard Co.; John H. Koch, dist. mgr., American Machinist; Albert Polk, Sheffield Corp.; Earl Cook, Sheffield Corp.; Dave McConnell, Sheffield Corp.; John L. Graves, sales mgr., Saco-Lowell Shops; Francis W. Copp, Lynd-Farquhar Co.; Joseph Wolf, Wm. Halpern & Co.; Harold Edwards, Cincinnati Milling & Grinding Machines, Inc.; Jack Batterson, Pratt & Whitney, Div. Niles-Bement-Pond Co.; V. H. Wadlund, Pratt & Whitney, Div. Niles-Bement-Pond Co.

(Eighth row)—T. M. Callender, Bullard Co.; E. A. Sundstrom, Bullard Co.; F. T. Wright, Rudel Machinery Co.; Ltd.; H. R. Barton, Sales, Cone Automatic Machine Co.; A. J. Jones, Landis Tool Co.; Wm. Ibsen, Landis Tool Co.; J. L. King, Lloyd & Arms, Inc.; R. A. Powell, Eccles-Germain Machinery Co.; Frederick Allen, sales engr., Lapointe Machine Tool Co.; J. D. Allan, Pratt & Whitney, Div. Niles-Bement-Pond Co.

(Not in photograph)—N. J. Koppi, mgr., R. K. LeBlond Machine Tool Co.; Philip R. Smith, Sheffield Corporation.

Personnel Attending National Machine Tool Builders' Association-American Machine Tool Distributors Association Sales Conference, Purdue University, August 15-20, 1949

(Left to right, first row)—R. H. McGrath, National Machine Tool Builders' Association; H. T. Amrine, associate professor, Time & Motion Study Department, Purdue; B. N. Brockman, vice president & sales mgr., R. K. LeBlond Machine Tool Co.; Harry J. Loberg, professor, Dept. Adm. Engineering, Cornell University; O. D. Lascoe, professor, manufacturing processes; Jerome A. Raterman, pres., Monarch Machine Tool Co.; John R. Carlson, sales mgr., Heald Machine Co.; Frank L. Armstrong, vice pres., Marshall & Huschart Machinery Co.; Fred Crosby, asst. sales mgr., Kearney & Trecker Corp.; Tell Berna, general mgr., National Machine Tool Builders' Association.

(Second row)—Fred Martin, sales engr., Buhr Machine Tool Company; H. C. Volkmann, Gisholt Machine Company; Brooks Ewing, sales & ser. dept., National Machinery Co.; E. P. Ferguson, sales engr., Joseph Monahan, Agent; John C. Mullen, chief engr., Joseph Monahan, Agent; A. E. Lynch, Gisholt Machine Company; John Marshall, Gisholt Machine Company; Howard V. Myers, Gisholt Machine Company; Ross Clendening, Cincinnati Milling & Grinding Mchs., Inc.; J. Barbier, Sheffield Corporation; Virg Green, Sheffield Corporation; A. R. Currie, Jones and Lamson Machine Co.; George A. Saunders, sales engr., Barnes Drill Co.; Louis Mahlmeister, Sheffield Corporation; Frank R. Glenn, sales engr., Wm. K. Stamets Company; Roy Schwendener, sales engr., E. I. Essley Machinery Co.

(Third row)—R. E. Skinner, Seifreat-Elstad Machinery Co.; K. A. Henn, Jones & Lamson Machine Co.; John E. Oatis, Oatis Machinery Company; Robert Everett, Oatis Machinery Company; Donald A. Taylor, Ohio Machine Tool Co.; T. L. Jenner, Pratt & Whitney, Div. Niles-Bement-Pond Company; Donald Gmeinev, Sundstrand Machine Tool Co.; Luis J. Garay, Giddings & Lewis Machine Tool Co.; Ferd Howell, sales engr., Machine Tool & Supply Co.; E. A. Korell, ser. & sales mgr. southwestern district, Giddings & Lewis M. T. Co.; F. J. Austin, dist. sales mgr., Kaukauna Machine Corporation; W. I. Wilt, Sheffield Corporation; C. Whims, Sheffield Corporation; James Luthman, Sheffield Corporation; Frank Vebber, sales engr., E. L. Essley Machinery Co.; C. A. Johnston, sales engr., E. L. Essley Machinery Co.

(Fourth row)—L. R. Burger, Logansport Machine Co.; Ellwood G. Peterson, president, Hannifin Corporation; A. C. Ekberg, Pratt & Whitney, Div. Niles-Bement-Pond Co.; William I. Rose, Pratt & Whitney; John Mourer, Landis Tool Co.; H. V. Bailey, Greenlee Bros. & Co.; R. S. Kline, Modern Machine Shop; Joseph G. Juett, J. Lee Hackett Company; Harold Jensen, George Gorton Machine Co.; D. L. Moore, Colcord-Wright Machinery & Supply Co.; Fay Aller, Sheffield Corporation; W. K. Kimmel, dist. mgr., Oilgear Company; Charles J. Linduska, Clearing Machine Corporation; A. S. Bennett, Voss Machinery Co.; Thomas H. Kelley, Lodge & Shipley Company.

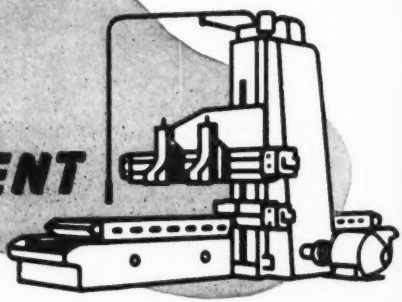
(Fifth row)—Ralph H. Cox, dist. mgr., National Automatic Tool Co., Inc.; J. W. Waller, State Machinery Co., Inc.; L. D. Lowe, State Machinery Co., Inc.; R. G. Beveridge, State Machinery Co., Inc.; R. J. Schonhoft, R. K. LeBlond Machine Tool Co.; James Hobbs, Landis Tool Co.; James B. Rosborough, vice pres., Moline Tool Company; Herschel A. Miller, Greenlee Bros. & Co.; Kenneth L. Volz, Carlton Machine Tool Co.; T. Wm. Ver Valin, Joseph Monahan, Agent; Harvey Kovara, George Gorton Machine Co.; R. H. Brandenburg, Marshall & Huschart Machinery Co.; C. A. Weir, Marshall & Huschart Machinery Co.; E. G. Priebe, Marshall & Huschart Machinery Co.; Clarence Paneitz, Oilgear Company; B. L. Schmid, Voss Machinery Company.

(Sixth row)—Harry J. Todd, Mine and Smelter Supply Company; Pierson Wagner, Vandyck Churchill Company; S. S. Coe, L & J Press Corporation; Wilbert Riehemann, Avey Drilling Machine Co.; E. W. Schatzman, Jr., Avey Drilling Machine Company; L. J. Feeley, Pratt & Whitney; F. H. Erhard, Mine and Smelter Supply Co.; E. B. Crabtree, Heald Machine Company; G. P. Robert, Heald Machine Company; H. T. Schaller, Heald Machine Company; Louis Laurel, Mine & Smelter Supply Company; S. L. Beckwith, sales mgr.—lathes, Amer. Steel Foundries, King Machine Tool Div.; E. W. Metz, Robert R. Stephens Machinery Co.; John E. Metz, Robert R. Stephens Machinery Co.; Joseph Bungartz, Cincinnati Milling & Grinding Mchs., Inc.

(Seventh row)—L. W. Hauptman, Landis Tool Co.; R. R. Almand, Chandler Machinery Company; David O. Thompson, Marshall & Huschart Machinery Co. of Indiana, Inc.; Milburn Hogan, Marshall & Huschart Machinery Company of Ind., Inc.; A. S. Linzell, Hydraulic Press Mfg. Co.; J. C. Crose, Gisholt Machine Company; W. W. Meade, Gisholt Machine Company; Raymond Hering, Gisholt Machine Company; T. S. Sterrett, Cincinnati Bickford Tool Co.; Sherman W. Schauer, Cincinnati Bickford Tool Co.; Adrian DeVoogd, E. L. Essley Machinery Co.; Lewis E. Blakely, E. A. Kinsey Company; Richard W. Tesch, Lucas Machine Div., New Britain Machine Co.; Grant E. Scott, Jr., Liberty Planers, Inc., Div. of Hamilton-Thomas Corp.

(Eighth row)—H. F. Sherman, E. W. Bliss Co.; H. W. Cooper, J. H. Ryder Machinery Co., Ltd.; T. C. Houston, Cone Automatic Machine Co., Inc.; Mel Gudel, Eccles-Germain Machinery Co.; B. D. Ashbaugh, Hydraulic Press Mfg. Co.; P. F. Hawkins, Monarch Machine Tool Co.; R. K. Hewitt, Monarch Machine Tool Co.; Gordon E. Smith, E. A. Kinsey Company; James P. Klinger, Kearney & Trecker Corporation; Louis J. Bohm, Federal Machinery Sales Company; Gale Long, Gardner Machine Company; A. M. Mattio, Liberty Planers, Inc., Div. Hamilton-Thomas Corp.

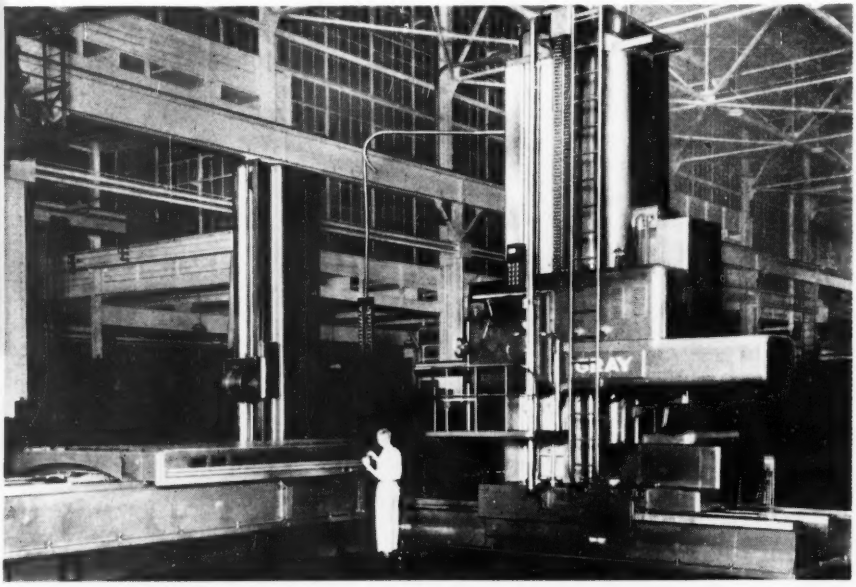
NEW SHOP EQUIPMENT



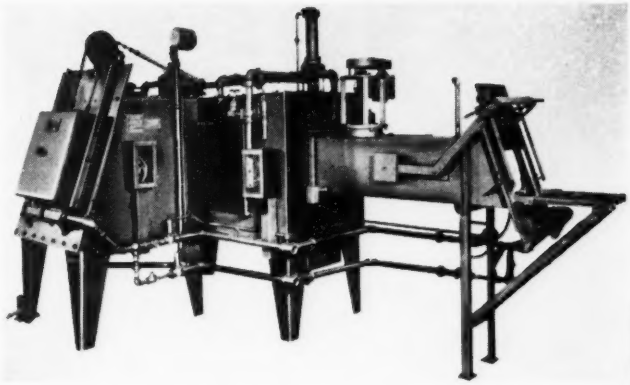
Planer-Type Horizontal Boring, Drilling and Milling Machine

Built by The G. A. Gray Co., 3611 Woodburn Ave., Cincinnati 7, Ohio, the planer-type horizontal boring, drilling and milling machine illustrated herewith is equipped with an 8-inch diameter nitralloy bar which has a continuous feed of 7 feet and is driven by a 75 h.p. a.c. motor. Twenty-four bar speeds are selectively controlled by three levers. Two of the levers are range selectors and the third lever is the speed selector. Four speed ranges with six speeds in each range are provided.

The machine has Gray non-metallic way bearings for the table, main column base, head guide ways, end support column base, and end support and bar. Con-



Gray 8-Inch Planer-Type Horizontal Boring, Drilling and Milling Machine



Lindberg Combination Preheat-High Heat L-Type Furnace

trols for the head, column, bar, and table are centralized on a pendant switch, which is universally mounted and counterbalanced on anti-friction supports. Controls for starting, stopping, jogging, and regulating the speed of the variable voltage feed motors are also mounted on the pendant station. Selector switches on the pendant station control clutch engagement and the hydraulic clamps of the various units. Motor-operated rheostats are used. Direct reading tachometers and controls for the spindle motor are also mounted on the pendant station.

Two variable voltage feed motors are used, one for feeding and traversing the table and another for the column base, head, and bar. The head and end support movements are synchronized, with the head and end support having 12 feet of vertical travel above the top of the table. The table is supported on two vee and two flat non-metallic bearing ways and is moved by a spiral pinion drive meshing direct with a rack. Adjustment for eliminating backlash between the pinion and rack is provided The table is 9 feet wide and has a 20-foot longitudinal movement on the bed. The main column has 10 feet of feed or rapid traverse movement on the runway. The end support column can be moved 3 feet on its runway.

A Gray "Woodpecker" positioning device provides for setting of the various units within 0.00025 inch by pressing a micro-jog button on the pendant switch. A power driven extra heavy duty rotary indexing table capable of supporting castings weighing up to 85 tons is used with the machine. The table, which has non-metallic bearing surfaces and is graduated a full 360 degrees, is mounted on top of the regular table and has a surface of 7 x 8 feet. A protected dial indicator is used for precision setting of the table by a push button.

A heavy duty right angle milling head having a 48-inch extension can be mounted on the machine. The head can be rotated through 360 degrees and may be firmly clamped in any desired position. A 60-inch diameter continuous feed facing and boring head is also used with the machine.

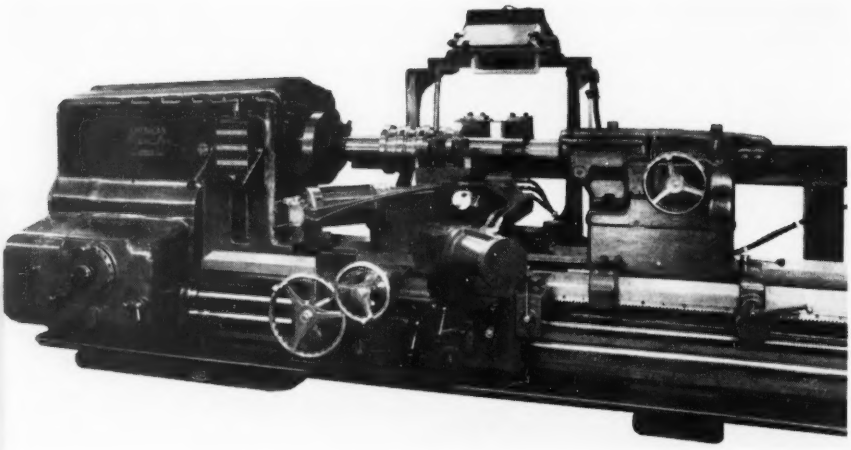
Built for The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, the machine weighs 175 tons and will be used to machine cast steel parts, weighing as much as 180,000 lb., for huge presses employed in automobile, refrigerator, and aircraft manufacture.

Preheat-High Heat Furnace

The Lindberg Engineering Co., 2469 W. Hubbard St., Chicago 12, Ill., has announced the development of a furnace of the L-type for the bright hardening of high speed tool steels. Molybdenum, 18-4-1, 18-4-2, or cobalt type high speed steels, it is claimed, can be hardened virtually bright and totally free from decarburization or carburization with this atmosphere hardening furnace, which is primarily designed to harden precision high speed tools, such as cutters, thread chasers, and so on, that have fine cutting edges and cannot be ground or cleaned after hardening.

Unique in construction, the furnace consists of a preheat, high heat, and quench unit, all built into one complete assembly. The preheat unit is built at a right angle to the high heat unit. The quench unit is located directly behind the high heat unit and is designed to quench the steel by means of a forced convection, cooled, protective atmosphere. Sections of high speed steel up to 2 inches can be fully hardened by the atmosphere quench. Since the steel does not contact the air until after the preheat, hardening, and quench are completed, bright results totally free from decarburization or carburization can be obtained.

The protective atmosphere used in the



"American" 26-Inch Capacity Hydraulic Roll-Duplicating Lathe

furnace is generated in a separate atmosphere generator. Either the atmosphere generated by a Lindberg Hyen generator from city, natural, propane, or butane gases or the atmosphere generated by a Lindberg Hyco generator from charcoal can be used. To keep the hardened steel bright during the tempering operation, the company has available retorts for use in its standard air tempering furnaces. The same protective atmosphere used for hardening is also used in the retort for bright tempering.

The Lindberg L Furnace is not limited only to high speed steels but may be used for hardening all tools and dies, bright copper brazing, bright silver brazing, and bright annealing.

Hydraulic Roll-Duplicating Lathe

A lathe for producing rolling mill shape rolls has been developed by The American Tool Works Co., Cincinnati, Ohio. Designed to reduce machining time to a minimum, the machine is said to produce such a smooth surface finish on the roll that subsequent finishing operations are eliminated.

Available in several sizes to accommodate various sizes of rolls, the lathe utilizes a hydraulic duplicating mechanism for controlling the cutting tool as it reproduces from a template the desired roll shape on either chilled iron or steel roll blanks. The mechanical feed, effected through a conventional quick-change gear mechanism, is continuous while the tracer controlled angular slides provide for stepless generation of the contours. Standard round nose cemented carbide cutting tools are used for both the roughing and finishing operations.

The machine is driven by a 40 h.p. constant speed motor and is sufficiently substantial for machining rolls up to 26 inches in diameter. For generating the roll grooves, a dual slide all-hydraulic duplicating mechanism is provided. The two slides, one of which is superimposed on the other, are mounted at 45 degrees to the work axis and at 90 degrees to each other, with the cutting tool mounted on the upper slide. With this combination of slides, any conceivable roll shape can be generated, it is stated.

The hydraulic equipment employed in the machine is simple and compact, consisting of a motor-driven pump which supplies a 300 p.s.i. hydraulic pressure, and a tracer valve which meters the oil directly to the cylinders which control the movement of the slides that support the cutting tool. The pump unit is located on the floor at the rear of the lathe. The tracer valve is mounted on an independent slide, the movement of which is controlled from the front through a screw and nut by the small handwheel at the right of the top slide. This positioning of the tracer valve is the means by which the relation between the stylus and the finish turning tool is established before cutting is begun. A micrometer dial, graduated in thousandths and reading

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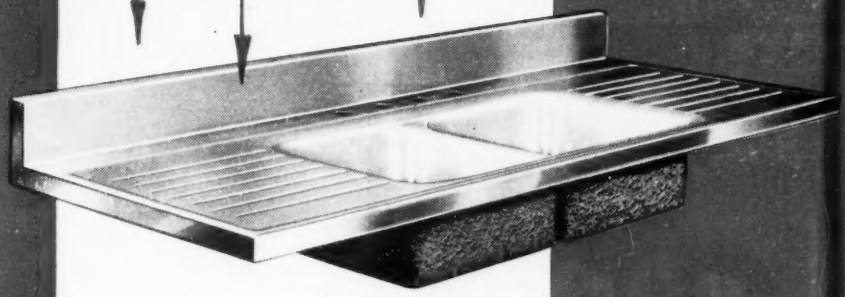

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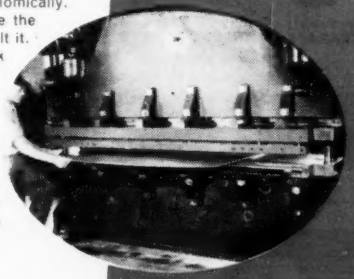

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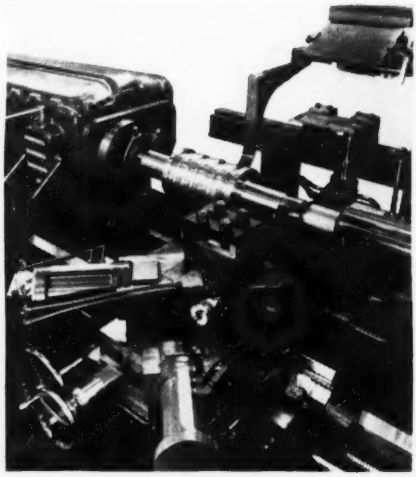
directly on the work diameters, is located on the adjusting handwheel for accurately determining the diameters desired. Side positioning of the tool in relation to the roll blank is accomplished by the micrometer adjustable template support bar. A sensitive, manually controlled lever is provided for quick advance and retraction by power of the angular slides.

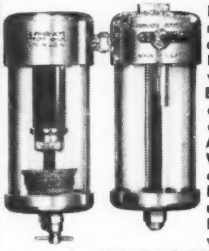
The instantaneous selection of the slide desired for operation is accomplished by a conveniently located directional lever which operates a selector valve for activation of the slide desired. An additonal operating convenience and safeguard is provided by a hydraulic lock controlled by a small operating lever at the front, by means of which the functioning of the duplicating mechanism is arrested while the cutting tool is being retracted from a groove, thus eliminating any danger of bumping the tool against the sides of the groove during withdrawal. After withdrawal of the cutting tool, this same lever, when thrown in the opposite direction, releases the hydraulic lock and permits the toolslide to again advance to the work by power, thus reducing operative effort to a minimum.

A unique operational aid is provided by a compound clear vision mirror located at the rear of the carriage above the template. The mirror shows the operator at a glance the exact relation between



Close-Up View of "American" 26-Inch Capacity Hydraulic Roll-Duplicating Lathe

"M·B" AUTOMATIC
Air Line FILTERS and LUBRICATORS



FILTER element removes solids .00039 and larger. TRANSPARENT BOWL provides visibility. LUBRICATOR delivers desired volume of oil, no more, no less. Adjustable Venturi Valve permits efficient operation on broad range of volume and pressure... Bowl can be refilled without shutting off air supply. THESE DEVICES CAN BE USED AS SEPARATE UNITS OR IN COMBINATION.

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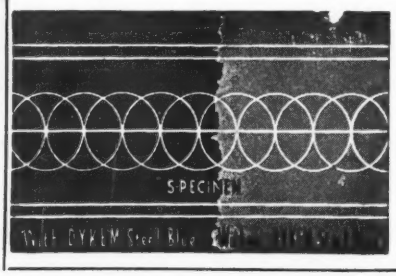

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the template and the stylus.

The headstock of the machine provides, through three selective spindle gears, 27 speeds in close increments, including low speeds to accommodate form tools, if and when necessary, and high speeds for the effective use of cemented carbide turning tools. The cutting tools are held in a massive 4-stud toolholder and are supported by underneath adjustable supports. A massive tailstock with oversized spindle is provided which has a built-in ball-bearing revolving center of ample capacity to support the largest and heaviest roll for which each size of the lathe is recommended.

Boring and Milling Machine

For precision boring and milling operations, the DeVlieg Machine Co., 450 Fair Ave., Ferndale 20, Detroit, Mich., has brought out the "Jigmil" shown in Fig. 1. Adaptable to production, tool, and experimental work, the Jigmil provides for automatic positioning of the machine slides in the horizontal or vertical planes through a sequenced electrical cycle. Hole spacing in the workpiece is said to be controlled to an accuracy of 0.0001 inch through the simple operation of a single push button. The machine is provided with a power push-button operated mechanism for locking and releasing the cutting tools in and out of the spindle bar.

According to the manufacturer, a particularly important advantage in the operation of the Jigmil is that all controls are arranged so as to provide for full and uninterrupted vision of the relation between the cutting tool and work at all times (see Fig. 2). The master switch unit travels with the spindle head, providing uniform operating convenience in any position throughout the full range of the machine. Bar movement is effected through a screw actuated power feed and

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SPACE-SAVING "CB" SERIES for laboratory and shop uses

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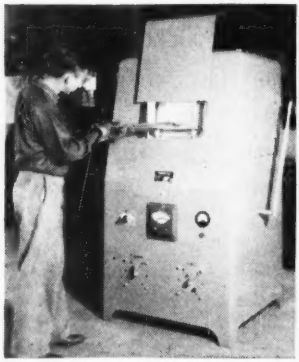

Simple to install and easy to operate, this CB-55 (also larger sizes) handles exact pilot operations and other heat-treating work requiring close control of extremely flexible heat cycles. Size: 32" d. x 32½" w. x 64" h., with chamber 12" d. x 8¾" w. x 6" h. Uniform heat from 3 silicon carbide elements over and 3 under the chamber. All controls on front panel: automatic temperature controller, input meter, 36-tap auto-transformer with switch interlock, cut-off switch, and safety pilot-light. Wedge-fit counterbalanced door. 230-v., 60-cyc., 1-ph. A.C., with variable input 3.5 to max. 11 kw. Atmosphere connections optional. Write for bulletin today.

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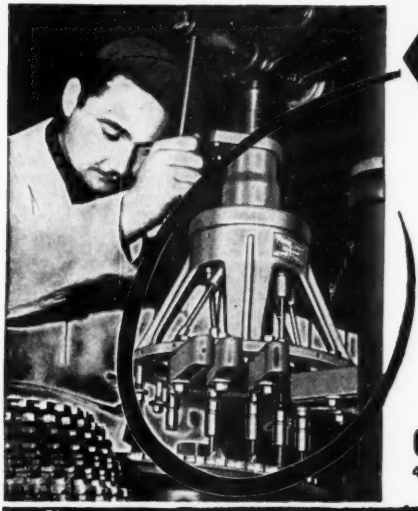

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ADJUSTABLE TO ANY HOLE PATTERN
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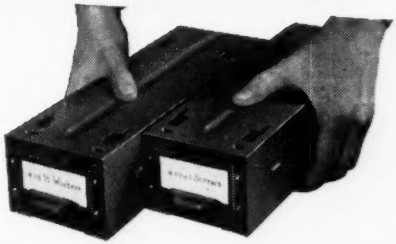

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rapid traverse, responsive to a four-position lever extending down from the master switch. A wheel for hand operation and a micrometer dial enable accurate depth readings to be obtained. A bar depth control available as extra equipment provides for direct dial indicator readings of depth movement.

Push buttons control the operation of the spindle start, brake, and jog. A "break stop" button de-energizes the spindle motor and simultaneously applies a hydraulic brake for quickly stopping the spindle. Operation af an "all stop" button electrically stops the spindle ro-

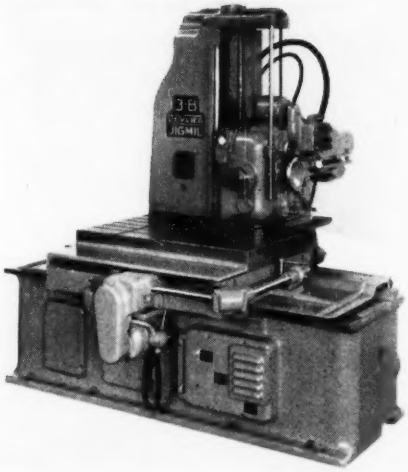
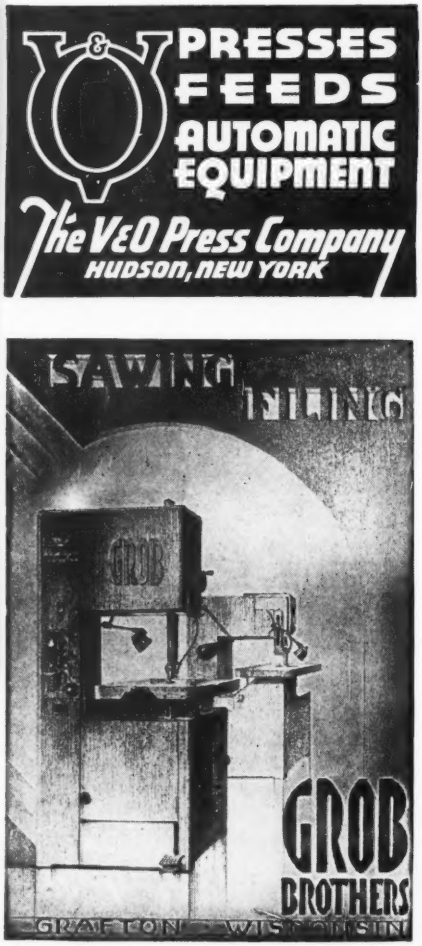


Fig. 1—DeVlieg Model 3-B "Jigmil"

tation and all other functions that may be in operation. A selector switch is provided for forward and reverse operation of the spindle.

Push buttons are used to control the power feed and rapid traverse movements of the vertical and horizontal slides, which are coordinated with a single selector lever projecting from the feed unit in the bed. Horizontal or vertical movements are obtained as required through this selector lever. All functions are electrically interlocked so that no power can be applied in error or to a locked slide.

The spindle is mounted in precision anti-friction bearings. The spindle bar is made of Nitralloy and slides in Nitralloy liners in the main spindle sleeve. All gears are of alloy steel, shaved for finish and accuracy. Gears are carried on hardened



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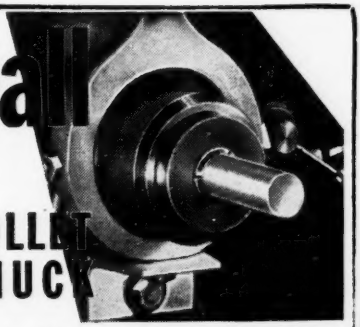

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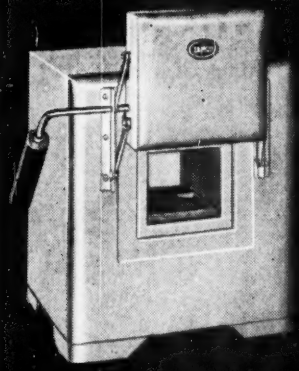

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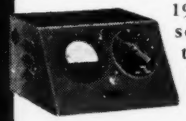

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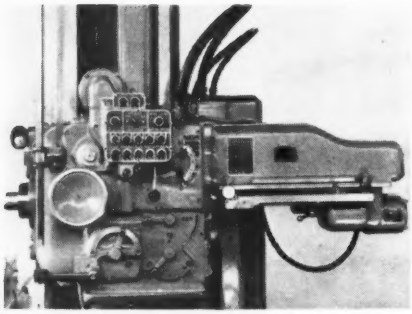

Fig. 2—Close-Up View of Controls of DeVlieg "Jigmil"

and ground spline shafts mounted in anti-friction bearings.

Designed to provide a means for machining parts from four sides without rechucking, the index table of the Jigmil comprises a heavy box section platen with standard T-slots and cross slots identical to those in the main Jigmil table. The index table carries four accurately spaced index plungers in the form of a square. The plungers are hardened and lapped and operate in hardened bushing inserts. Each plunger is actuated individually by a rack and pinion.

In the main Jigmil table, accurately spaced holes are provided at the same center distances as the plungers in the index table. These holes contain hardened and lapped bushings and, by lowering the index table plungers into the appropriate bushed holes in the main Jigmil table, four 90-degree indexing positions are obtained. At each 90-degree position of the index table, two plungers are in engagement with two bushings in the Jigmil table.

At the front side of the index table a locating hole is provided for setting-up purposes. This hole represents the accurate center point of the index table. Zero location can be picked up quickly from this locating hole, thereby enabling holes to be bored from four sides of a workpiece in precise alignment.

Referring to the diagram in Fig. 3, the process of indexing is carried out in the following sequence: (1) Clamps "A" are released. (2) Two plungers at "B" are disengaged from the bushings in the main Jigmil table. (3) Nut "C" is rotated, causing cam "D" to elevate ball "E." Ball "E," riding in a double cone, elevates the index table so that it can be freely

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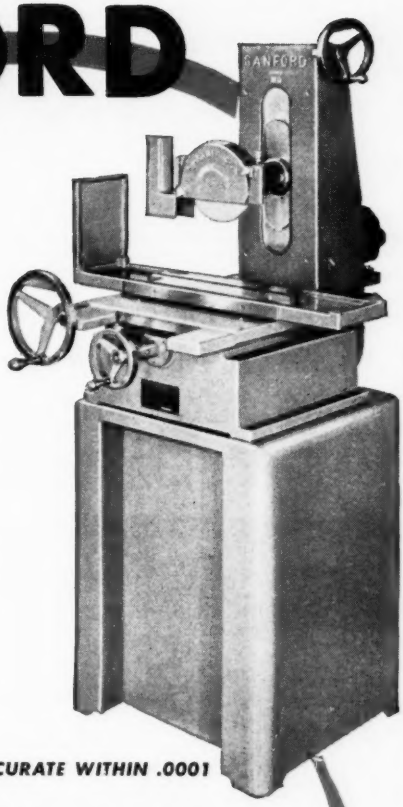

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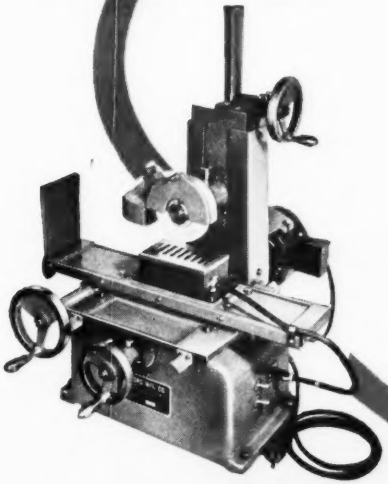

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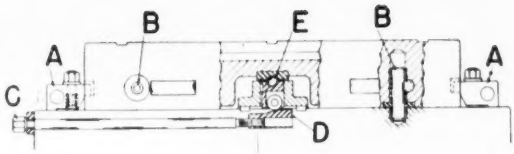

Fig. 3—Diagram Showing a Section through the Standard Index Table and Main Table of the "Jigmil"

rotated. Ball "E" also allows the index table to float a limited amount and permits the index plungers to freely find their location in the bushings in the Jigmil table. (4) Two index plungers are then engaged in the required position, nut "C" is rotated in the reverse direction, lowering the index table, and the clamps "A" are moved into position and locked.

The Jigmil is available in two models. The Model 3-B has a 3-inch bar with No. 40 N.M.T.B. taper, 16-inch bar feed, 36-inch vertical movement, and 48-inch horizontal movement. The Model 4-B has a 4-inch bar with No. 50 N.M.T.B. taper, 20-inch bar feed, 48-inch vertical movement, and 60-inch horizontal movement. The range dimensions of the Model 3-B provide 12 square feet of boring area, while the range dimensions of the Model 4-B provide 20 square feet of boring area.

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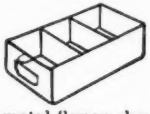

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Inclinable Punch Press

Designated as the Model 55, an inclinable punch press of 56-ton capacity has been announced by the Johnson Machine & Press Corp., 620 W. Indiana Ave., Elkhart, Ind. The machine features a 32 x 34-inch bolster plate, a ram face measuring 14 x 18 inches, and an unusually large die space with 14-inch standard to 18-inch maximum opening to provide an extra large working area. The press bed is rigidly constructed and has a 20-inch opening through the back. An interchangeable thin steel bolster is available to provide a still greater die space without sacrificing strength.

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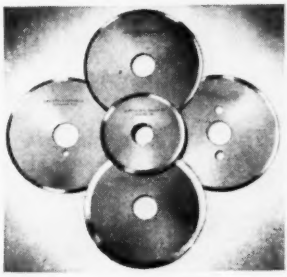

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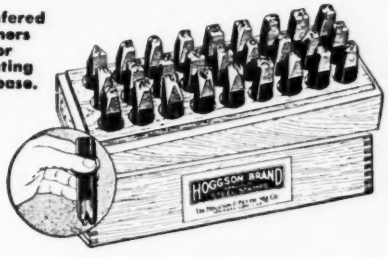

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The Answer to *Safety* and *Efficiency* in Punch Press Operation

- **light as cardboard.**
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Because of the inherent lightness of Magnesium, it is now possible to make these tongs long enough to keep the worker's hands completely out of danger. Particular attention is given to the hand grip on all tongs to insure against abrasions when used on highly repetitive work.

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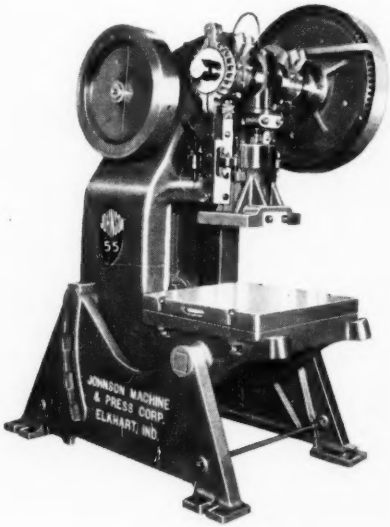
The press is said to be capable of handling work up to 16¾ inches deep at a rate of 45 pieces per minute either in the vertical position or in tilted positions up to 36 degrees. Using the press in tilted positions allows the work to drop away without the use of an injector. A tripping device is said to protect the operator in the event of spring breakage.

The press frame is of cast semi-steel. Extra long gibs are provided to distribute the thrust load over a wide area. A friction-type brake located on the machine



Johnson Model 55 Inclinable Punch Press

may be quickly and easily adjusted by turning a small knob. The flywheel of the press is said to be of solid web, breakage-proof construction and is equipped with tapered roller bearings.

Manufacturing Machine Tool

Known as the "Contour-matic," a semi-automatic hydraulically controlled manufacturing machine tool which is said to cut every solid material will be displayed at the National Metal Exposition by The DoAll Co., Des Plaines, Ill. Designed to provide for the fast precision cutting of materials through a repetitive production cycle easily controlled by the operator, the machine employs an endless band of

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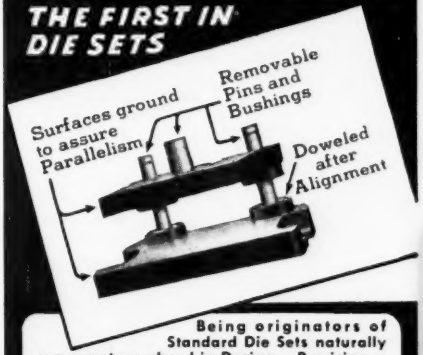

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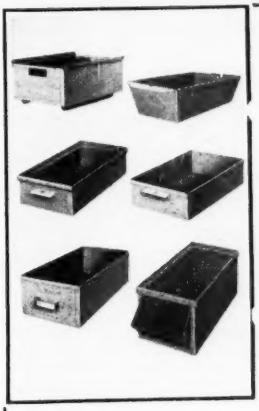

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teeth to slice through the work, removing material in sections.

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The Contour-matic has an infinitely variable and stepless speed range from 40 to 10,000 f.p.m. which is said to be sufficient to provide correct velocities for contour or friction cutting of every material. Variable hydraulic feeding pressure up to 100 lb. is provided. Computation of correct blade velocity, feeding pressure, and type of blade to be used in cutting materials is shown on a "job selector" dial mounted on the upper door of the machine. The operator merely dials the material to be cut and immediately is provided with the correct cutting information.

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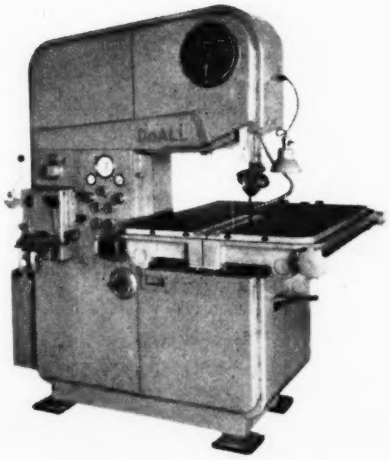

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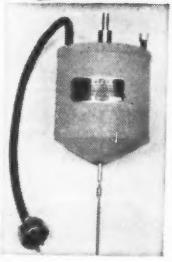

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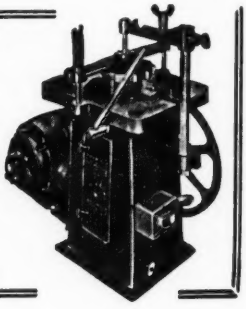

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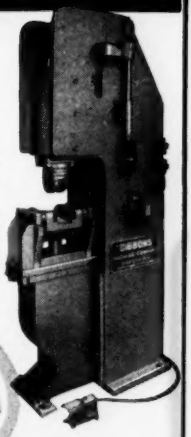

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three-speed transmission and the "Speedmaster," a variable speed pulley device. The operator pushes the machine starting button and positions the gearshift lever for the desired speed range. Then, turning a hydraulic control valve he watches a dial speed indicator to make adjustments for the exact velocity desired.

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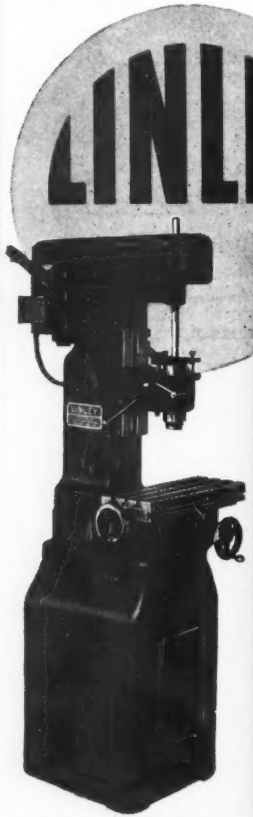
The proper guide can be brought into position by merely rotating the turrets mounted above and below the work table. The turrets hold three different guide assemblies for both high and low speed sawing with insert and roller type guides. An adjustable floodlight illuminates the work being cut, while a flexible air jet keeps the work free of chips.

The design of the Contour-matic also includes an automatic flash welder for joining all widths of saw bands from ⅛ to 2 inches. Besides sawing operations, band filing and polishing jobs can be performed with the machine.



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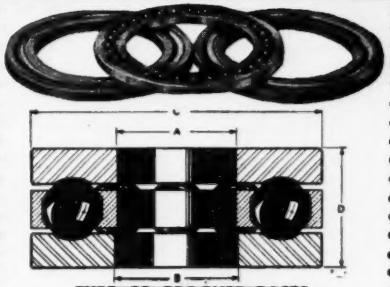

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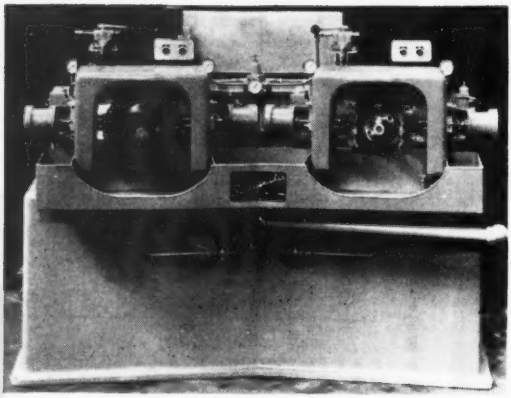

Gisholt Two-Spindle Brake Drum Superfinisher

surface roughness of approximately 150 microinches r.m.s. is claimed to Superfinish such drums down to 30-40 microinches r.m.s. With one operator, the total production is said to be over six brake drums per minute.

The spindles and controls of the machine are independent of each other. Each work station includes a simple arbor and two sets of stones (two roughing stones and two finishing stones) which are timed together to work as the brake drum both oscillates and revolves. The stoneholder movement and the clamping of the workpiece are controlled by air. The complete spindle cycle is automatic.

Metal Cutting Saw

Said to meet the requirements of most metal cutting jobs, the metal cutting saw shown herewith will be displayed at the National Metal Exposition by W. F. Wells & Sons, North on U. S. 131, Three Rivers, Mich. Designated as the Model M, the machine has a capacity of 9 x 18 inches and can be used for many milling and planing operations, such as slotting, removing corners of die blocks, and so on. Easily operated, the machine is arranged to raise and lower hydraulically to eliminate manual fatigue.

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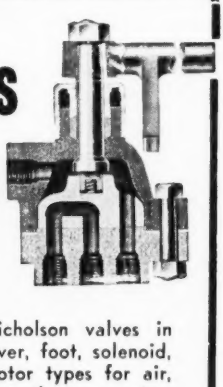

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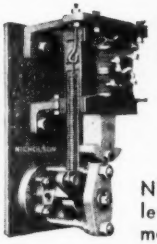

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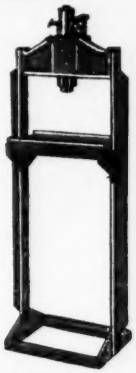

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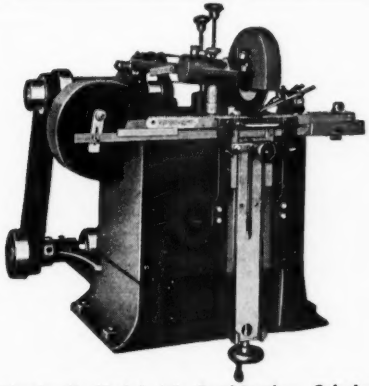

Wardwell Model EC Combination Grinder The only single unit grinder adaptable for hack, band and circular saws that does not depend on the shape of the grinding wheel to form the shape of the tooth. • This unique feature enables operator to grind a variety of blades without dressing or changing wheels.

sharpening 1 gross of hack saw blades PAYS for this machine!

One gross of hack saw blades can be resharpened at least 6 times—actually saving you the price of the machine!

Wardwell EC Grinder gives old blades a keener, longer lasting cutting edge—because new blades are usually not ground after hardening.

Wardwell EC wheels will not burn, anneal or injure hardness of teeth. Sharpen Circular, Hack or Band Saw blades on one machine!

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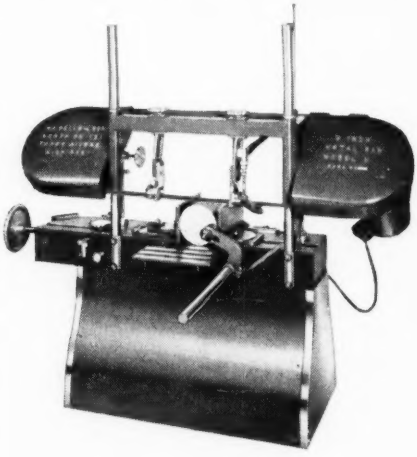
All rotating parts of the unit operate on ball bearings. Columns are placed at each end of the machine to provide for maximum rigidity. The cutting head is of one-piece welded construction and includes beams for blade guides and column housing, thus assuring alignment and total blade enclosure. Blade guides are provided with single screw adjustment for rotating the blade.

Other features of the machine include a quick-acting vise located on a continuous screw for clamping rigidly in all positions; tip-off block for clamping and bolting jigs, fixtures, and so on; stock stop which automatically moves out and up at the completion of the cut to eliminate binding of stock on the blade; hydraulic control which provides for maximum efficiency and smooth operation; special metered valve for displacing oil at selected pressure on the blade to prolong blade life; arrangement whereby the machine will stop at a selected height when the cut is completed or may be set for a repeating cycle; and rotating blade brush for cleaning chips from between the teeth, as well as from the sides of the blade.



Wells Model M Metal Cutting Saw

Standard as well as special saw blades can be furnished for the machine. Other equipment also available includes stock stands, cooling system, rotary base, and automatic vise control.

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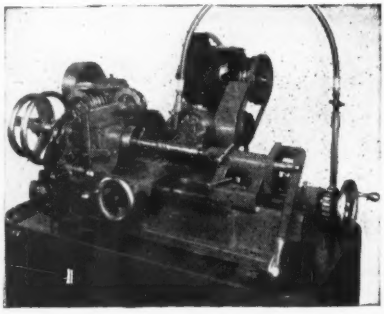
Thread Miller



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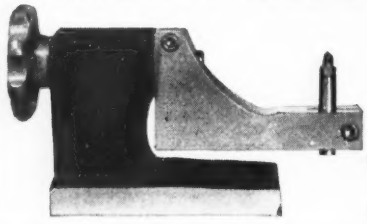

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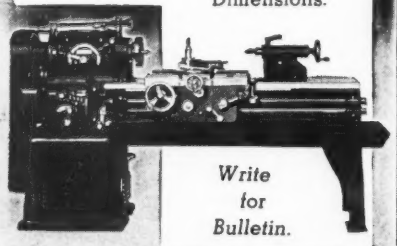

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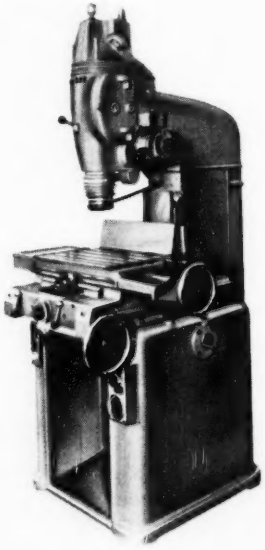
THE CARROLL & JAMIESON MACHINE TOOL CO.

BATAVIA OHIO U. S. A.

Jig Grinder

A Swiss precision jig grinder combining high accuracy with unusual output capacity has been made available by the Hauser Machine Tool Corp., Dept. MMS, Manhasset, N. Y. Designated as the Model 3S, the machine has a maximum grinding diameter capacity of 5 inches.

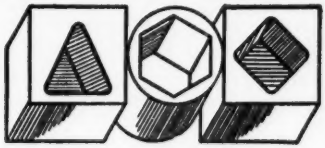
The quickly interchangeable spindle unit, incorporating automatically-lubricated precision ball and roller bearings,



Hauser Model 3S Jig Grinder

is driven by compressed air. By adjustment of the air line pressure, spindle speeds up to 75,000 r.p.m. are obtainable. Small and medium size holes are ground with the normal high-speed grinding spindle; larger holes, up to 5 inches, using a special set-off grinding head with eccentric adjustment. Grinding feed can be effected by a handwheel and graduated dial while the machine is in operation. Provision is made for grinding taper holes with an included angle up to 3 degrees for a length of $2\frac{7}{8}$ inches and with somewhat smaller angles for lengths up to the $3\frac{1}{16}$-inch vertical travel of the grinding spindle. Settings for the amount of taper are made by direct reference to a scale.

To facilitate gaging and inspection of the work during grinding, spindle rotation and reciprocation can be stopped and



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the spindle raised clear of the work. After inspection, the spindle can be lowered and grinding commenced again. A dial indicator reading to 0.001 inch is said to facilitate the grinding of blind holes accurately to depth.

The grinder table has a working surface of 22 x 12¾ inches, longitudinal travel of 16 inches, and transverse travel of 10 inches. The V-form table ways are protected against grinding grit. Coordinate settings are made by means of precision ground-thread lead screws fitted with pitch-correction devices. The machine also includes dividing drums and verniers, reading to 0.0001 inch, which are protected by glass windows and electrically illuminated. Coarse adjustments are made by large handwheels, while fine settings are effected by small knobs. Provision is made for locking the slides when settings have been completed.

Dry Lubricant

The Alpha Corp., Greenwich, Conn., has announced an economical grade of "Molykote" Lubricant, designated as the Type Z which is a specially prepared, smooth-textured molybdenum compound powder whose treatment and composition are said to make it particularly suited for extreme bearing pressure applications. According to the manufacturer, the lubricant has unusual chemical and thermal stability and inertness, resists the attack of all but a few acids, and its lubricating characteristics are not affected by temperature from the sub-zero range up to 750 deg. F. Moreover, the lubricant, it is claimed, adheres tenaciously to metal surfaces, a quality which, combined with unusual film strength, effectively prevents galling and seizing at bearing pressures in excess of the yield strength of most metals.

Molykote Type Z may be applied dry in the powder form or may be mixed with solvents, oils, or greases. It is claimed to be useful as a wear-in lubricant for dies,

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with the
JAY-DEE
Tapping Attachment
Jay-Dee employs an entirely new clutch principle, designed specifically to eliminate tap breakage. Instead of using coiled springs to provide driving pressure, it has a resilient material . . . 150 times more effective than steel . . . to produce safe torques at all times. This new attachment is simple as well as safe; definite torque settings for given tap sizes and taps can be changed in a few seconds without wrenches.
Can be used for horizontal or vertical tapping, stud driving, blind or through holes—on all reversible machines.
LARGE TAP RANGE
K-1 unit handles taps ½"-13¾" USS, a range normally requiring three attachments. Other units also available.
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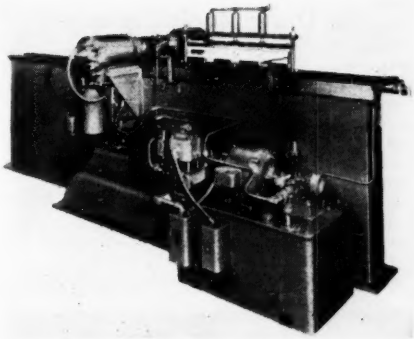
gears, and machinery; as a thread lubricant, especially on threaded connections subjected to high temperatures for sustained periods; as a means of effectively preventing freezing of threaded connections; and as a lubricating medium in performing difficult drawing and cold forming operations on stainless steel and other materials.

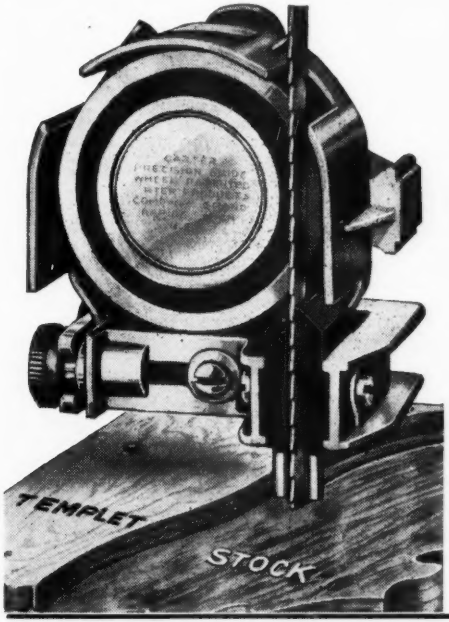
Duplex Milling Machine

A high speed duplex milling machine for use in the mass production of parts of aluminum, magnesium, and other light metal alloys has been introduced by Onsrud Machine Works, Inc., 3900 Palmer St., Chicago 47, Illinois.

Designated as the Type A-242, the machine includes cutter heads which are so positioned as to permit simultaneous parallel face milling on any two opposite sides of a production piece. The cutters are driven by two opposed motors, mounted horizontally. Work is placed in a holding fixture mounted on a planer type table which feeds the work to the cutters. Clamping is effected pneumatically, either manually or automatically. In automatic clamping, the air clamps are interlocked with the feed cycle and closed when the work travels between the cutters. An automatic return stop may be set at any predetermined point, depending on the length of the cut required. When the table reaches the end of the feed stroke, the cutter motors retract and the carriage automatically returns to its starting position.



Onsrud Type A-242 Duplex High Speed Milling Machine



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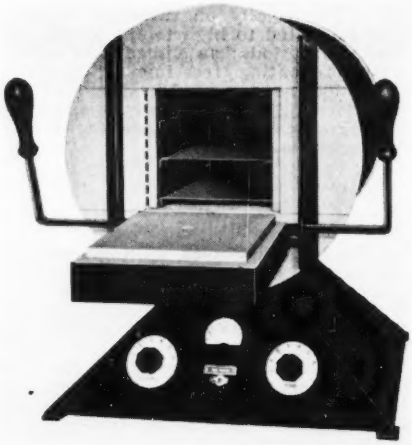
Air Draw Muffle Furnace

Hevi-Duty Electric Co., Milwaukee 1, Wis., has announced the completion of an air draw muffle furnace which has a temperature range of up to 1,250 deg. F. and is designed to provide a means for the rapid and uniform heating of metals and other materials. While its primary application is in the tempering or drawing of tool and die steels, the furnace may be used for practically any heating operation requiring temperatures to 1,250 deg. Fahrenheit.

A high speed, direct-connected centrifugal fan is located at the rear of the furnace chamber with its shaft extending through the rear wall to the drive motor. A heat-resistant alloy baffle is provided to direct the flow of air from the fan through a narrow passage between the heating elements and the baffle, then into the work chamber and back to the intake of the fan. Positive high speed circulation of air throughout the furnace chamber is said to result in the rapid and uniform heating of the work. Adjustable shelves are provided for locating the work at different levels. Two shelves are furnished as standard equipment.



Hevi Duty Air Draw Muffle Furnace

Metal Cutoff Machine

Positive drive, flexibility and ease of operation, self-centering vise adaptable to most contours and shapes, and maxi-

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured by

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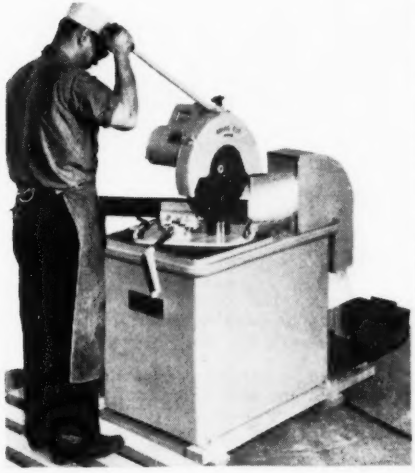
mum safety to operator are outstanding features claimed for the Stone "Swing-Cut" Abrasive Metal Cutoff Machine illustrated herewith, product of the Stone Machinery Co., Inc., 343 Fayette St., Manlius, N. Y. The machine has a capacity for cutting up to 3-inch solids and 4-inch pipe in both ferrous and non-ferrous materials.

Rigid construction, together with positive work-holding arrangement, is said to provide for long wheel life and also result in the production of straight cuts



Stone "Swing-Cut" Abrasive Metal Cutoff Machine

to close tolerances with a minimum of burr. A fast-acting self-centering vise mounted on a quickly adjustable swivel plate calibrated in degrees allows for a quick change from straight or 90-degree cutting to any desired angle of cutting. The waist-high working level of the machine, plus the excellent balance of the machine head accomplished through spring load control, is said to provide for maximum ease, as well as safety, of operation.

General specifications of the machine are as follows: motor, 5 h.p. geared-in-head induction type; motor speed, 3,500 r.p.m.; wheel spindle speed, 2,380 r.p.m.; arbor size, 1 inch; maximum wheel diameter, 16 inches; maximum floor space required, 2½ x 4 feet; shipping weight, approximately 600 pounds.

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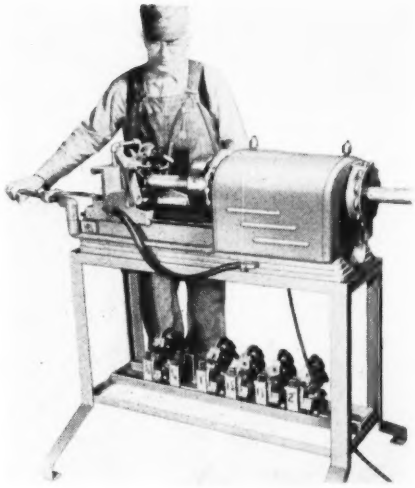
Portable Pipe Threading Machine

Known as the "Threadfast," a triple-purpose portable machine for cutting, reaming, and threading pipe up to 2 inches in diameter and threading solid rounds up to 1½ inches in diameter is announced by the Peerless Machine Co., 1600 Junction Ave., Racine, Wis. With the machine, work can be quickly chucked and unchucked as the spindle rotates due to a Roto-Lok wrenchless chuck which, in effect, is a rapid-acting rotary vise. Pipes, solid rounds, and bolts are said to be quickly centered and rigidly held with the chuck, which is designed to instantly grip and release the work. The chuck may be used for right or left-hand rotation, operating equally well in either direction.



Peerless "Threadfast" Machine

Designed to handle new or old pipe, the Threadfast includes a manually operated hand lever for feeding the carriage assembly forward on replaceable steel ways. Forming a part of the machine base is a removable drawer-type self-draining chip pan, directly beneath which is a reservoir for cutting oil. A gear operated vane-type pump delivers the oil from the reservoir to the die head.

All die heads used on the Threadfast are free-floating units which permit immediate and correct chaser contact. A hand operated toggle clamp quickly opens the die head for rapid removal of

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TOOL MAKERS SELF LOCKING BORING CHUCK - - - $15.00

Body Diameter—1½"; length 1⅜"
Shank Diameter—½"; length 1½"
Tool Movement—⅜" adjustable in thousandths
Tool Diameter—⅜"
Hardened and tempered screw, tool block and shank.

SPECIAL SHANKS AVAILABLE ***F.O.B. Manchester***

SMITH BORING CHUCK CO.
Box 69 **Manchester, Connecticut**

stock after the threading operation. The complete head assembly fits into vertical slots on the carriage, adequate bearing surfaces being provided in the slots to receive the machined bearings of the die head. The arrangement of the chasers in the die head enables the operator to watch the thread-cutting operation.

Electronic Contour Following System

An electronic instrument which is designed to follow the lines of a drawing with an electric eye and guide a machine tool to cut out metal parts according to the drawing has been announced by the Special Products Division, General Electric Co., Schenectady 5, N. Y. Designated as the G-E Contour Following System, the device is connected to a machine tool called a "slave unit" so that the machine's cutting tool reproduces in metal the drawing "seen" by the electric eye. As the "eye" moves along the lines of a drawing, the position of the cutting tool is changed accordingly by means of an electronic servo system, which emits signals to control the lead screws of the machine tool.

The contour control is designed to simplify the manufacture of irregularly-shaped metal parts which are difficult to produce by normal hand-controlled machining methods. The equipment is said to be capable of following a line in the form of a closed loop with a diameter as small as 0.06 inch. It scans the line of a drawing through a low-power microscope at a speed of 0 to 6 inches per minute. When the line is in the center of the microscope's field, the eye sends out an electrical signal at a frequency of 60 cycles per second. A 26-tube electronic circuit picks up this signal. If the phasing varies, the line is not in the center of the field, and the circuit instantly sets mechanical guides into motion to bring the eye and microscope back into position.

The microscope and the electric eye are placed on a movable mount, which rests on a lathe bed. The drawing to be reproduced in metal is set a fraction of an

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Aluminum

the lubricants used largely determine the results

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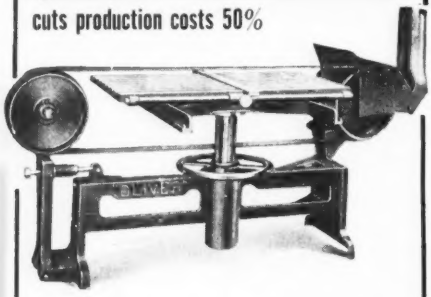
cuts production costs 50%



Users find "Oliver" Belt Grinders unmatched for polishing bronze tablets, aluminum and brass castings, etc. Convenient and efficient on work in its capacity. Table supports flat work 46"x26". Finishes in one setting. Other sizes available. Ask for Bulletin #298.

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New AUTODRILL
A Production Machine Tool
Gives Correct Speed and Feed

Variable spindle speed. 4" stroke (or more). Rapid spindle travel to work. Accurate depth stop. Controlled in feed. Rapid withdrawal.

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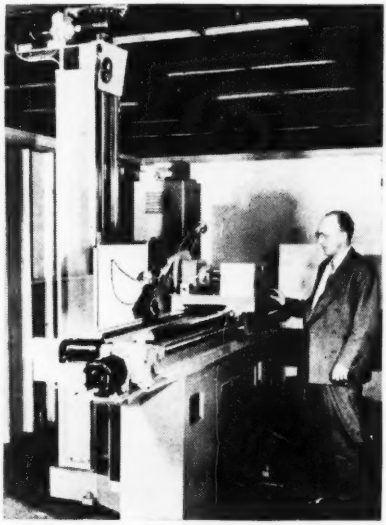
AUTO TOOL & ENGR. CO.
2908 Armitage Chicago 47, Ill.

inch from the microscope on another movable mount. When the line to be followed travels to the left or right, the microscope and eye move in their mounts to follow it. When the line travels up or down, the drawing itself changes position. These motions are transmitted electrically to the controls on the machine tool slave unit.

A set of change gears provides a range of reduction ratio between drawing and finished part from 3.75:1 to 60:1. Thus, the relative dimensions of a basic shape

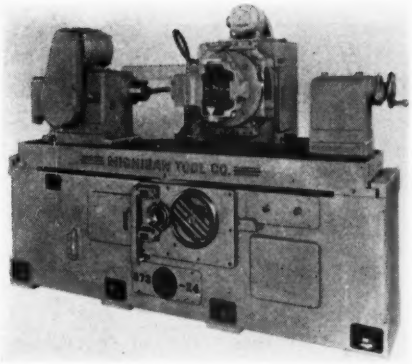


G-E Electronic Contour Following System

can be distorted in two dimensions by small incremental alterations on the control panel. Also, because of this range of reduction ratio, the error in the finished piece cut by the slave unit is said to be less than 0.001 inch.

Gear Finisher

Designated as the Model 873, a high production crossed-axis rotary gear finisher for heavy duty gears has been announced by the Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Available in two sizes, the machine is completely automatic in operation and is designed to handle spur or helical gears and involute splines from 0 to 18 or 24



Michigan Model 873 Gear Finisher

inches in diameter and up to 15-inch face width. Once the machine is set up for a given gear type, it is necessary only to load the gear between centers and push a "start" button to complete the entire operation.

In addition to automatic operation for production-line work, outstanding features of the Model 873 include ability to shave gears by any of three methods—"underpass," "transverse," or "traverpass;" ability to curve-shave (crown) wide face gears, if desired, as well as narrower gears; minimum floor space requirements; convenient location of controls at front of machine; fast cutting due to inclusion of a "rapid approach" feed in the machine cycle and automatic in-and-return feed; and special interchangeable cutter head available to provide for finishing of internal gears.

Universal Hydraulic Grinder

Product of Rivett Lathe & Grinder, Inc., 22 Riverview Rd., (Brighton) Boston, Mass., the Rivett No. 1024 Universal Hydraulic Grinder shown herewith is said to perform practically all internal and external grinding jobs encountered in the average toolroom. The general work range includes the grinding of holes from ⅛ to approximately 9 inches in diameter and up to 8-inch depth and the grinding of work with external diameter up to 12 inches and up to 18 inches long. Straight, taper, two-angle, face, and shoulder surfaces can be ground. Work may be held in a collet, step chuck or jaw chuck,

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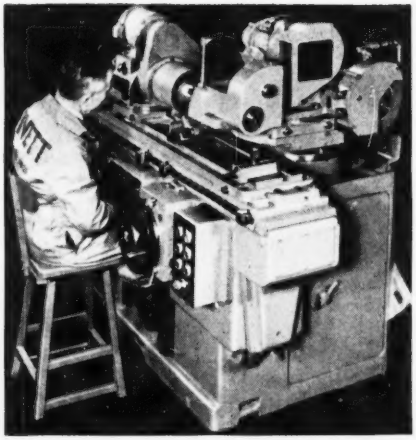
THE NATIONAL REFINING CO.
HANNA BLDG., CLEVELAND 15, OHIO

on a faceplate or between centers.

The design of the machine includes a double-end wheelhead which can be quickly swiveled 180 degrees to position either the external or internal wheel for grinding. Internal spindles are available in extension arbor, solid extension, and deep-hole types for operation at speeds from 6,000 to 35,000 r.p.m. The external spindle is designed to accommodate a 12 x 1½-inch face wheel on either end. All grinding spindles are of the flange-mounted cartridge type with anti-friction bearings, grease sealed for life.

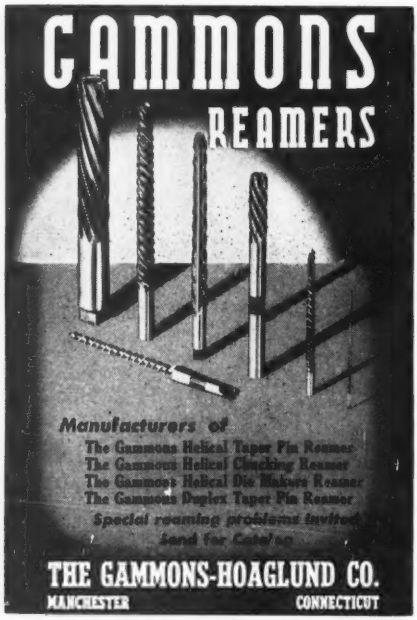


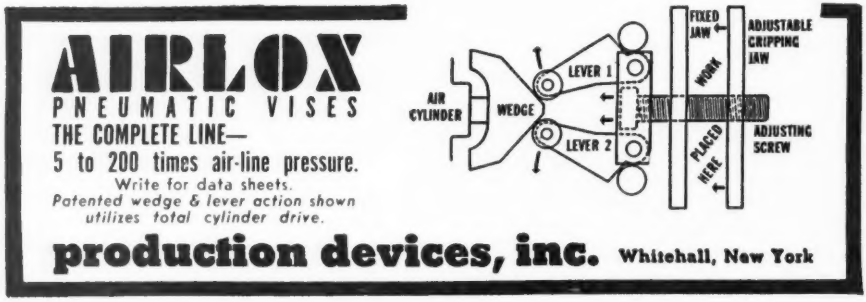
Rivett No. 1024 Universal Hydraulic Grinder

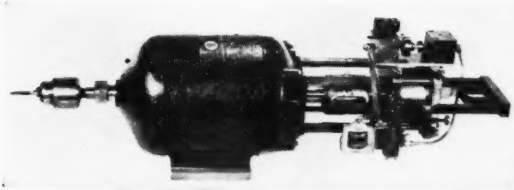
The workhead spindle has infinite speed adjustment. Collets and step chucks can be installed directly in the spindle for accurate and quick mounting of work. A standard 5-inch sine bar is used to measure the swivel of the workhead or table for accurate taper grinding. A micrometer table top, fine feed for compensating wheel wear, and hydraulic table control are additional features of the machine.

Tapping Unit

Designed to operate in any position and at any angle so that it can be used in production work either singly or in gangs on index or transfer machines, the air-operated tapping unit illustrated herewith, product of the Black Drill Co., Di-







Black Air-Operated Tapping Unit

vision of Black Industries, 1372 E. 222nd St., Cleveland 17, Ohio, utilizes the same principle of traversing the rotor as in Black drilling units. According to the manufacturer, the rotor actually shifts for the full length of stroke so that the motor shaft can be made solid, thus providing for maximum rigidity and accuracy.

The unit is operated by air through a double-acting air cylinder controlled by a built-in four-way air valve. Adjustable needle valves control the flow of air so that the tap follows its own lead without chamfering the first threads and does not strip the threads on the return stroke, it is claimed. Reversal is obtained through a secondary air cylinder, operating from the same air supply as the main cylinder, which uses a limit switch to reverse the motor when the tap has reached the proper depth at the same time that the main air cylinder starts the return stroke. Depth is held within 0.001 inch so that there is no danger of tap breakage even when tapping blind holes, the manufacturer states.

Small Punch Press

Known as the Benchmaster Midget, a small punch press with capacity of one ton plus under continuous, heavy duty operation has been announced by the Benchmaster Mfg. Co., 2952 W. Pico Blvd., Los Angeles 6, Calif. Useful in performing punching, shearing, staking,

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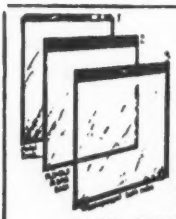
riveting, forming, coining, and other operations, the press has a standard maximum stroke of ¾ inch and is provided with a ¾-inch hole in the ram. Shorter strokes are available on special order. The approximate speed with a 1,725 r.p.m. motor is 290 strokes per minute. The ram can be made to repeat by simply removing one screw. The ram dovetail is gibbed for wear adjustment, and the ram screw is threaded 1 inch long, allowing for a ½-inch adjustment.

The alloy steel crankshaft of the press has a ¾-inch outside diameter and rotates in replaceable bronze bushings. The machine is equipped with a sliding key-type clutch and a 20-lb. flywheel measuring 9 inches in diameter. The overall height of the press is approximately 17½ inches, and the tool weight (less motor) is 65 lb. The die space to the bolster plate (ram up) is 3¾ inches, and the throat depth is 2⅛ inches. The bolster plate is removable and has dimensions of 4 x 6 x ⅝ inch with a 1¾-inch hole in the center.

Benchmaster Midget Punch Press

Aluminum Alloy

A general purpose alloy known as Kaiser Aluminum Alloy 150S will be exhibited at the National Metal Exposition by the Permanente Products Co., Aluminum Division, 1924 Broadway, Oakland 12, Calif. According to the manufacturer, the alloy provides for unusually high strength in the finished part, uniform



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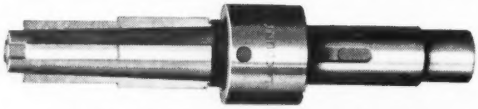

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Designed for Accuracy, Strength and Long Service. No fragile parts to wear out. The three blades used in construction correct any inaccuracy of the bore. A set of 5 will take bores from ⅜ inch to 4 inch inclusive. Extra keys can be furnished on No. 5 Mandrel for bores to 7 inches.

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grain size in all tempers, clear uniform etched finishes, clear colorless anodized finishes, fast high luster buffing, and high workability in an intermediate temper.

Spatter-Proofing Compound and Rust Preventive

Known as "Protect-O-Metal" No. 8, a combination spatter-proofing compound and rust preventive for protecting parts and raw stock from rusting prior to welding and between operations is being marketed by G. W. Smith & Sons, Inc., 5400 Kemp Rd., Dayton 3, Ohio. Applied with a brush, spray, or by dipping, the material, it is claimed, dries in less than an hour to a thin, transparent coating which prevents rust up to six months in the weather and up to two years on steel stored indoors. The coating is also said to prevent the adhesion of all flash and weld spatter during welding operations and reduce the time required to clean welds.

According to the manufacturer, Protect-O-Metal No. 8 will not cause porosity or harm welds in any way and can be safely used on any metal surface. The coating need not be removed after welding since it is claimed to serve as a good base for subsequent painting. Protect-O-Metal No. 8 is also said to be suitable in protecting beveled plate edges from rusting prior to welding and in protecting overlapped sections which are inacessible for painting after welding.

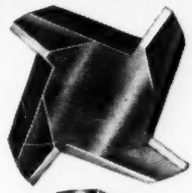
The product is supplied ready for use in 1 and 5-gallon cans and 55-gallon drums.

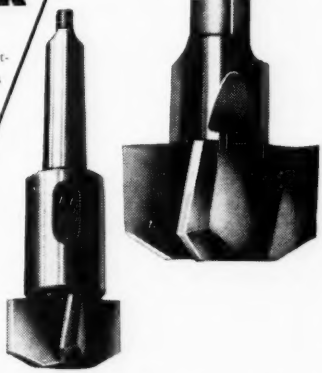
Hoppers

The accompanying illustration shows five different sizes of one type of hopper developed by Kraus Design, Inc., Dept. MMS, 41 S. Water St., Rochester, N. Y. The hoppers range in size from 4-inch

100% MORE FEED
when enlarging holes with . . .

S-J SCULLY-JONES New
CORE DRILL CUTTER





100% more feed because four flutes are cutting instead of two. Also, this New Cutter removes approximately 45% of its diameter. Result — less time per operation.

Cut tooling costs on set-ups for enlarging holes, where guide bushings are not used. Only 4 Drivers are required for the 25 S-J Core Drill Cutters.

Rigidity is assured by the short body of the Driver. This eliminates one of the causes of chatter.

Use these S-J four-fluted Core Drill Cutters and Drivers

- radial drills
- engine lathes
- turret lathes
- boring mills
- and similar machines

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Kraus Hoppers

model (at right) to a 32-inch model.

Each of the hoppers was designed for a specific purpose. The 4-inch size, for instance, was developed to handle screws 0.227 inch long x 0.045 inch in diameter and is being used in conjunction with a newly-developed hopper handling washers of 0.100-inch diameter x 0.025-inch thickness with a 15-degree bevel. These hoppers are arranged to feed the oriented parts into nests of a special assembly machine where the washer is placed on the screw right side up and the assembly is ejected—all automatically. Various other models of hoppers can also be readily designed.

Cylindrical Die Thread

For producing threads on pipe plugs and fittings by a cold forging process that forms the thread by displacement of metal, the Reed Rolled Thread Die Co., Worcester 2, Mass., has developed a cylindrical die thread rolling machine which is available in two models (A22 and A23) that may be supplied with either manual or semi-automatic feeds suitable for rolling $\frac{1}{8}$ to 2-inch pipe threads from 300 to 1,500 per hour in pipe plugs and fittings made from miscellaneous steels (including stainless), brass, bronze, and aluminum.

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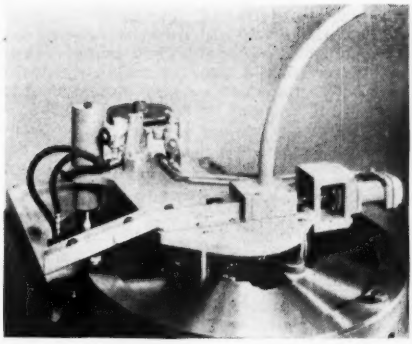


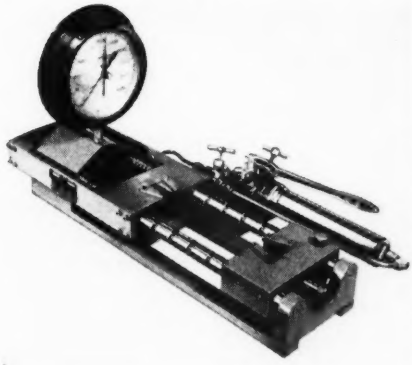
Reed Model A22 Cylindrical Die Thread Roller Arranged with Semi-Automatic Feed for Pipe Plugs

The work blank is supported and positioned between three synchronously rotating cylindrical dies which act on the blank simultaneously and hold it rigidly in the proper rolling position. The dies are said to always remain in match during rolling. The feed is effected by means of cam-actuated toggles. As the work rolls between the dies, the rolling pressure causes the material to follow the pattern of the dies. Control of work dimensions is accomplished by adjustments for diameter, length, and taper.

Portable Tensile Tester

Steel City Testing Machines, Inc., 8833 Livernois Ave., Detroit 4, Mich., announces a portable tensile testing ma-

Steel City Model PO-40 Portable Tensile Tester



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chine which is particularly adapted for testing pipe welds and other types of welds where on-the-job testing is preferable. Its use, however, it not limited to field testing as its high degree of accuracy is said to make the machine satisfactory both for laboratory and shop testing.

Designated as the Model PO-40, the machine has a capacity of 40,000 lb. and can be used to make tests on specimens from 6 to 13 inches in length and up to ¾ inch thick and 2¼ inches wide. Hydraulically operated by means of a hand pump integral with the base, the machine is easily adjustable and is light enough (slightly over 200 lb.) to be carried by two men. The Model PO-40 is furnished complete with a pump (which contains its own reservoir), easy-to-read dial gage, and one set of flat jaws.

Alloy Cast Steel

Development of an alloy steel capable of fulfilling unusual engineering requirements of sub-zero service at operating temperatures as low as minus 423 deg. F. has been announced by the Lebanon Steel Foundry, Lebanon, Pa. An austenitic cast ferrous alloy containing 19.50 per cent chromium and 9 per cent nickel among other alloying constituents, the steel, identified as Grade 22, is believed to have particular usefulness of application in meeting exacting requirements of the oil, chemical, and other processing industries.

According to the manufacturer, the steel has shown no structural changes down to minus 423 deg. F. in hundreds of testing laboratory impact tests from production lots of (L)-22 castings, and the same cumulative tests have indicated appreciable increases in hardness directly proportional to the decrease in temperatures. An added factor of engineering importance is that the tensile strength of the particular cast austenitic alloy varies inversely with temperature and in direct relationship with hardness. Also significant is that the alloy may

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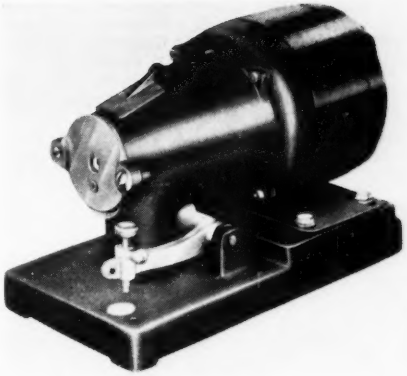
Pittsburgh 12, Pa.

be easily welded by either gas or electric processes without the need for subsequent heat treatment since low temperatures do not seriously impair the as-welded impact resistance, it is claimed.

Wire Stripper

Designed primarily to place wire stripping on a production basis, the "High Speed" Wire Stripper illustrated herewith, product of The High Speed Hammer Co., Inc., 307 Norton St., Rochester 5, N. Y., is said to instantly and completely remove insulation from the ends of solid, stranded, or multi-conductor cable or wire up to ½ inch in diameter. A positive, easily adjustable stop is provided for any length of stripping up to 1½ inches.

According to the manufacturer, the stripper is easily set up for operation and engineered to provide years of trouble-free performance. The cutting knives



"High Speed" Wire Stripper

are circular and are made from a special alloy steel. A new cutting edge is said to be easily obtained by slightly turning

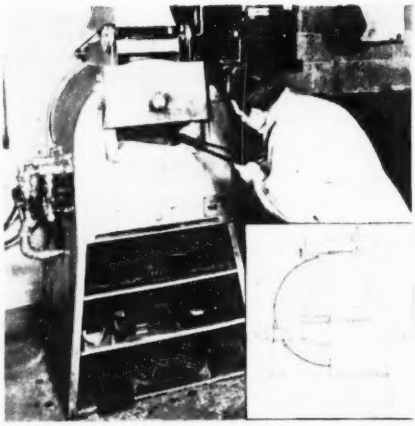
the knives, the knives themselves being quickly replaceable if necessary. All adjustments for length or diameter of wire can be easily and quickly made.

The stripper is furnished complete with a ¼ h.p. 110-volt 60-cycle single-phase motor which is direct connected to the stripping mechanism. A switch and cord with plug are also supplied with the unit, which has a shipping weight of 70 pounds.

Heat-Treating Furnace

Practical for a wide variety of metal heating processes in toolrooms and shops, a furnace featuring an inverted muffle section which can be used to quickly convert the furnace from semi-muffle to full muffle for atmosphere hardening is announced by the Sunbeam Stewart Industrial Furnace Division, Sunbeam Corp., 4433 Ogden Ave., Chicago 23, Ill. A removable rear plug permits center heating of long bars where desired.

The furnace is designed to operate over a 300 to 2,400-deg. F. temperature range and is available in three sizes having heating areas of 4 x 8 x 12, 6 x 12 x 18, and 9 x 15 x 24 inches. The furnace is adaptable to two-valve manual control or automatic temperature control employing an air/gas proportioning valve. The sturdy three-shelf stand of the furnace keeps tongs, work, spare parts, and so on, within easy reach of the operator.



Sunbeam Stewart Heat-Treating Furnace

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Economy TOOL & MACHINE CO.

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Pillow Block

An improved unit type of anti-friction bearing pillow block which is designed to hold fast with a vise-like grip to shafts revolving at high speeds has been developed by SKF Industries, Inc., Erie Ave. & Front St., Philadelphia 34, Pa. The pillow block, which can be equipped with either ball or spherical roller bearings, is constructed with a tapered inner ring and a tapered split sleeve which, when the ring is pressed against it with a tightening nut, contracts and wraps around the shaft.

Applicable to hoists, pumps, fans, blowers, conveyors, lift trucks, and other machinery, the pillow block is furnished completely assembled and prelubricated for immediate installation and operation. Special floating seals are said to prevent the leakage of lubricants and the entrance of dirt and other foreign matter into the bearing. The pillow block is available in either the "free" or "held" type and in shaft sizes from $1\frac{7}{16}$ to $2\frac{7}{16}$ inches.

Soft Blank Top Jaws

A complete line of slip jaws and soft blank top jaws is being offered by the Petersen Machine Co., 4000 Fourth Ave., S., Minneapolis 9, Minn. Over 20 sizes to fit all popular makes of two, three, and four-jaw chucks are available. All jaws are machined and drilled to fit American Standard master jaws. Special jaws can be furnished on order.

Multiple Spindle Drill Head

Known as the "Adjustafix," a multiple spindle drill head which is said to provide for maximum economy in multiple drilling by eliminating major changes in setup from job to job is being marketed by the U. S. Drill Head Co., 616 Burns St., Cincinnati 4, Ohio. According to the manufacturer, as much as 90 per cent of the drill head can be left intact, yet a complete engineering change-over can be accomplished by simply changing the drill pattern plate and relocating spindles on the new pattern plate to conform to the new design. The number of drill pat-

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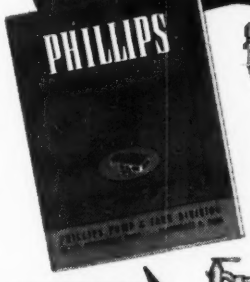
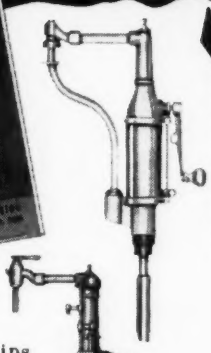


THIS WAY

Fully describes Phillips Hand Operated Quart Stroke Barrel Pumps. Attaches to any barrel with a 1½ or 2" threaded opening... for handling oil, alcohol, turpentine. Model 19 with swing return drain shown.

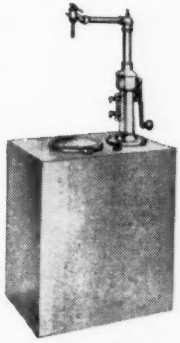


THIS WAY

Shows various Phillips Hand Operated Gallon Stroke Barrel Pumps for 1½ and 2" threaded openings. Model 174 shown is ideally suited to lubricants and coolants.

Describes Phillips Tank Units with Hand Operated Gallon Stroke Pumps. Tank of Model 81 shown is 20 x 27 x 30" high. Ideal for battery installation. Can be supplied with casters or dolly for movement to any location. Other sizes available.

THIS WAY



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DEPENDABLE PHILLIPS SERVICE STATION EQUIPMENT

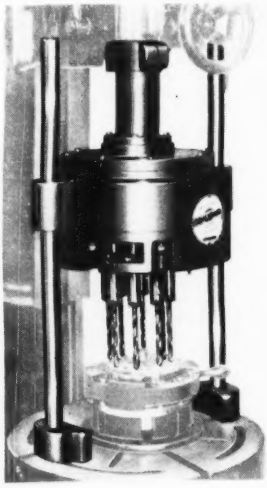
PHILLIPS PUMP & TANK CO.

5050 Brotherton Rd. Cincinnati 9, Ohio

terns possible with the head is limited only by the number of pattern plates available.

The spindle and idler constructions are separate assemblies, both being self-contained. Thus, the use of compound gears on the idler shaft provides the exact tool speed required for a given job. No change of gearing in the main drive box is necessary when the tool speed is changed.

Designed for easy installation on machines now in use, the Adjustafix can be used not only for drilling but for tapping, reaming, spot-facing, boring, counterboring, and milling operations. Although designed principally for multiple operation, the head can be easily adapted to single-spindle operation. Fully automatic lubrication for either horizontal or vertical operation of the head is provided.

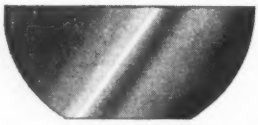


U. S. "Adjustafix" Multiple Spindle Drill Head

Pallet Rack

For heavy duty pallet stacking installations, Equipment Mfg. Inc., 21550 Hoover Rd., Detroit 5, Mich., is offering a prefabricated pallet rack constructed of structural channel. The rack consists of an upright end member which can be used at either end of or between sections, and a bed constructed with two channel

WOODRUFF KEYS



We manufacture a complete line of Woodruff keys in all standard sizes. These sizes range from as small as ½" x 1/16" to keys as large as 3½" x ¾". All keys are carefully checked for burrs, slivers, etc. before being shipped to you. Only the finished tested keys are permitted to leave our plants.

We carry a complete stock of high quality, dependable keys. Send for our catalog for complete information on Woodruff keys, taper pins, machine keys, and machine racks.

STANDARD STEEL SPECIALTY COMPANY

BEAVER FALLS PENNSYLVANIA

PLANTS: BEAVER FALLS, PA. • HAMMOND, IND.

AERO SPIRAL FLUTE COUNTERSINKS

STOP CHATTER

Cut clean and accurately. Stocked in 60, 82, 90, 100 degree included angle. Check specification chart. Lower prices in quantities. Send for catalog sheet. If not available from your mill supply dealer, order direct.

AERO TOOL COMPANY

D-10, 6948 Avalon Blvd., Los Angeles 3

No.	Cutter Dia.	Shank	Price
1909-2	3/8"	1/4"	$1.50
1909-3	1/2"	1/4"	1.80
1909-4	5/8"	1/4"	2.40
1909-5	3/4"	1/2"	3.10
1909-6	1"	1/2"	4.60
1909-7	1 1/8"	1/2"	6.60
1909-8	1 1/4"	1/2"	7.00

cross members. All joints are welded, including the faceplate on the end of the bed. Holes are positioned in the upright to meet user specifications for pallet load underclearance.

Dimensions and capacities of the pallet rack can be varied according to user pallet sizes and load requirements.

Die Lubricant

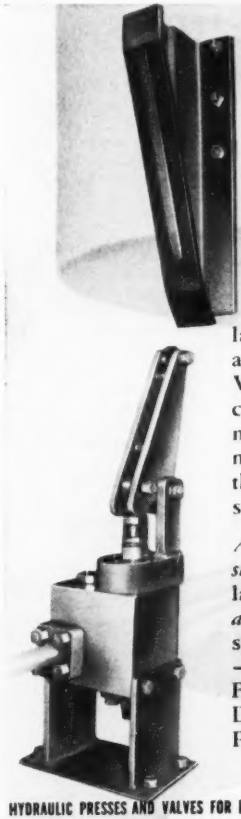
"Die Slick" No. 9, a lubricant for pressure die casting dies which is said to assure maximum production by preventing scoring and sticking and allowing for easy ejection of castings from the die, is being manufactured by G. W. Smith & Sons, Inc., 5407 Kemp Rd., Dayton 3, Ohio. Applicable with a brush or spray as required, the lubricant, it is claimed, leaves no carbon gum, or other residue in the die, therefore eliminating the necessity of frequent die cleaning.

According to the manufacturer, Die-Slick No. 9 has been found of particular value in the production of zinc alloy castings that are to be plated, such as automotive hardware, since it leaves no undesirable deposit or stain on the casting that might prove detrimental to subsequent plating. It is stated that the compound is non-toxic, causes no objectionable fumes or smoke, and is easy to use. The lubricant is furnished in 1 and 5-gallon cans and 55-gallon drums.

Indexing Fixture

Highly accurate and rapid indexing of workpieces is said to be possible with the Ettco-Emrick No. 97 Electric Indexing Fixture shown herewith, product of the Ettco Tool Co., 598 Johnson Ave., Brooklyn 6, N. Y. The unit can be used for punch press, tapping machine, drill press, and other similar operations.

Table indexing motions are controlled electrically through a modified Geneva system to assure smooth, shockless action. At each indexing station, the table is accurately locked in place by a hardened locating pin. A built-in electric con-



OPERATION SAFETY

A weight-loaded accumulator can be dangerous—without an R. D. Wood Protectomatic Valve! Hydraulic pipeline failures can happen without warning—can mean a crashing tank or platform, machinery downtime throughout the system, extensive repair work, serious personal injury.

An R. D. Wood Protectomatic Valve stops this! Installed on an accumulator tank, this rugged valve means *automatic* control of the falling speed of a weighted accumulator —*automatic* freedom from danger. For *safety* in *your* plant, write for Data Sheets on the R. D. Wood Protectomatic Valve!

HYDRAULIC PRESSES AND VALVES FOR EVERY PURPOSE • ACCUMULATORS • ALLEVIATORS • INTENSIFIERS

EST. 1803

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PUBLIC LEDGER BLDG., PHILA. 5, PA.

Why THOR STAMPS Last Longer

. . . because they're made of a special, correctly-heated alloy steel. Central striking point assures uniform marking. Thumb side marking assures easy use.

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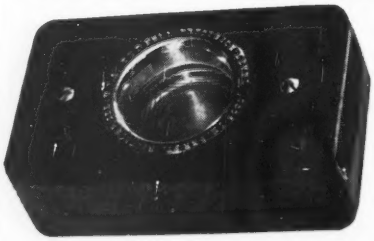
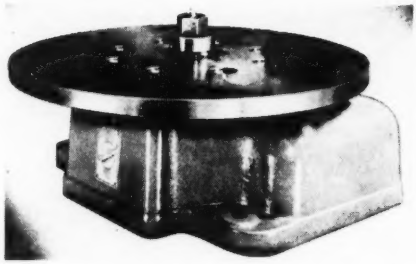
"ALL-WAY" LEVEL



The Fell Precision Level shows the level of all directions at once to an accuracy of .0005 inch per foot. It saves time in the manufacture and maintenance of machinery. Made in sizes 3½" x 6" and 5½" x 12", also 4" and 5" dia. for permanent mounting.

Write for information

WM. B. FELL CO.
320 McLAIN AVE. ROCKFORD, ILL.



Ettco-Emrick No. 97 Electric Indexing Fixture

trol automatically synchronizes the movement of the spindle and the table and also controls the downward motion of the spindle.

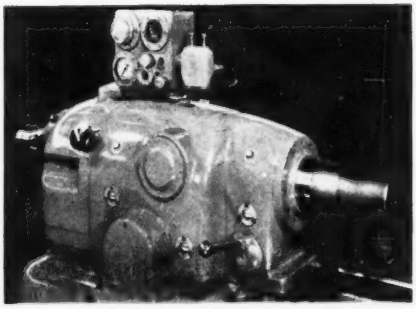
The fixture is offered with a choice of interchangeable indexing plates ranging in size from 10 to 14 inches in diameter. Engineering cooperation is available in designing plates to suit individual requirements.

Air Operated Collet Attachment

An air-operated collet attachment designed expressly for increasing the output of its 10-inch precision manufacturing lathe and its "Speedi-Matic" hand-operated screw machine has been developed by The Monarch Machine Tool Co., Sidney, Ohio. Designed to permit the use of a bar feed, the attachment is of the pusher type and is constructed to reduce operator fatigue on long production runs.

Two push buttons in the headstock of the machine control the collet attachment. The operator presses one button to open the attachment and the other button to

Monarch Air-Operated Collet Attachment Installed on a Lathe



close it. Quickly and easily applied to the camlock spindle nose of the lathe, the collet adapter accommodates standard collets in sizes for handling round stock from ⅛ to 1 inch. The collet attachment is only available for factory application to Monarch precision manufacturing and Speedi-Matic lathes.

Acorn Pushnut

An acorn type Pushnut for ¼-inch unthreaded rod is now being marketed by The Palnut Co., Irvington 11, N. J. Claimed to be particularly useful for holding wheels on toy carriages and wagons, wheelbarrows, push carts, and any other assembly where a decorative push-on type nut is desired for permanent application, the Pushnut is made of spring steel and has a cadmium finish. Brass, nickel, and chromium finishes are available on special order.

To install, the the Pushnut is merely pushed over the end of an unthreaded rod where it is said to firmly resist removal forces exerted against it. The acorn design of the nut is claimed to provide for a pleasing appearance.

Rotary Table

The Chicago Tool & Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill., has announced the addition to its "Palmgren" line of rotary indexing milling tables of a new model, designated as the No. 86, which has an 8-inch diameter rotary surface with two ⅝ to 1⅛-inch T-slots crossing at the center. A 1½-inch reamed hole is provided at the center of the table surface for a locating plug.

The No. 86 is graduated for the full 360 degrees, with the rotary feed effected through a worm and gear with a ratio of 40:1. The rotary indexing dial is accurately graduated in 15-minute intervals. Two hold-down clamps with thumbscrews are also furnished for the purpose of locking the table in position after indexing.

The table has an overall height of 3¼ inches and is provided with a 9¼-inch diameter base having two bolt and key slots for rigid mounting of the table to

Ames

PORTABLE

HARDNESS TESTER

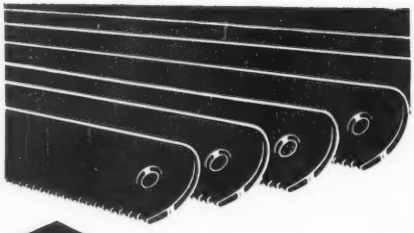
Flat and round bars, sheets, tubing and wire are tested on the spot without cutting off specimens. Punches, dies, cutters, saws and odd-shaped pieces are tested before and after heat treating. Used by metallurgists, inspectors and heat-treaters. Sizes for work 1" to 6" round and flat. Send for circular.

See Exhibit National Metal Exposition, Cleveland. Lower Hall Booth No. 2817.

AMES PRECISION MACHINE WORKS

Makers of Precision Bench Lathes & Milling Machines

WALTHAM 54, MASSACHUSETTS



TOP PERFORMANCE KEEPS STAR TOPS!

That's because they are made from the finest steel, scientifically manufactured and properly heat treated. Results, a faster clean cutting long life hack saw blade insuring maximum performance at minimum cost.

Your local distributor will help you choose the proper STAR blade for your job and will supply you with a free STAR Metal Cutting Booklet or Wall Chart for your shop. Both packed full of useful information.

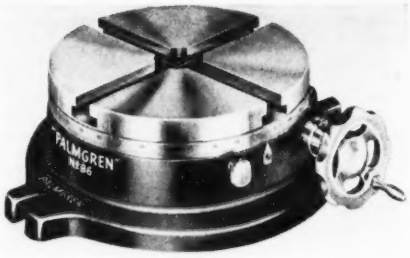
STAR STEELRITE METAL MARKING CRAYONS

Ask your STAR distributor about these new and improved metal marking crayons. Available in a variety of sizes, these crayons, made of genuine soapstone by special extrusion process, are uniform in strength and composition. Markings can be made on hot, cold, damp or grimy metal and withstand pickling, yet do not affect enamel application.

5092

CLEMSON BROS., INC. Middletown, N. Y.

Makers of Hand and Power Hack Saw Blades, Frames, Metal Cutting Band Saw Blades and the Clemson Lawn Machine



"Palmgren" No. 86 Rotary Table

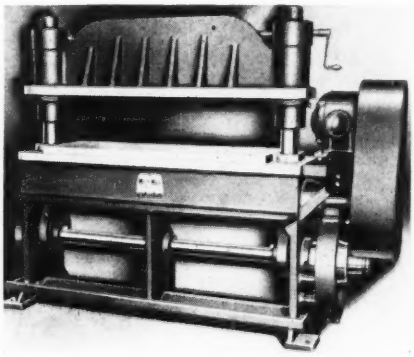
either a milling machine, drill press, shaper, or surface grinder. The base is made from a high grade gray iron casting, and the table top and all movable parts are accurately machined and finished.

Punch Press

Rated at 30 tons capacity, the Diamond Model 3048 Multi-Max Punch Press shown herewith, product of the Diamond Machine Tool Co., 3429 E. Olympic Blvd., Los Angeles, Calif., has a bolster area of 16 x 48 inches and a ram area of 10 x 48½ inches, thus allowing for the performance of a wide variety of metal stamping operations, including blanking, piercing, notching, bending, shearing, and drawing.

The press includes an underneath double crank drive mechanism and is of all-steel welded construction with a 4-point engaging clutch. The standard stroke is 2 inches, and the maximum

Diamond Model 3048 Multi-Max Punch Press



stroke to order is 4 inches. The press has a speed of 80 strokes per minute and standard shut die height of 10 inches. The ram adjustment is 2 inches. The press is geared with precision herringbone type gears. The crankshaft is 3 inches in diameter and is heat treated, ground, and highly polished.

Endless Round Belt

The United States Rubber Co., Rockefeller Center, New York 20, N. Y., has announced the addition of an endless belt to its U. S. Rainbow line for use on drills, high speed hammers, tappers, saws, valve refacers, and other small machinery. The belt is of round cross-section design, built without a splice to eliminate vibration. Cord pulling members are said to keep stretch at a minimum, and a bias cut jacket is said to protect the inner structure and ensure flexibility.

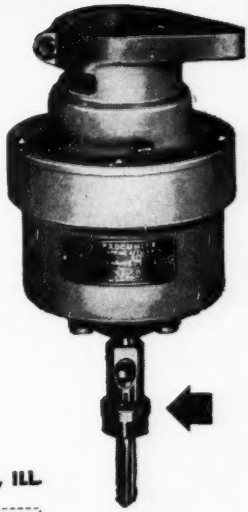
Recommended for quarter turn, mule, serpentine, cross, and many other special wheel driving applications, the endless round belt can be easily shifted on step-up pulleys for speed changes, and is available in sizes ranging from 3/8 to 1/2-inch belt diameter and from 6 7/8 to 156 3/8 inches inside circumference.

Cable Cutter

A portable hand-operated cable cutter introduced by the Beverly Shear Mfg. Co., 3000 W. 111th St., Chicago 43, Ill., employs a downward circular cutting principle which imparts a slicing action that is said to assure sharp, clean cuts on every strand of the steel cable at one stroke. Since the unit slices rather than pinches the material being cut, it is claimed to be particularly well adapted to cutting hollow core material, steel reinforced rubber hose, heavy electrical cable, conduit, and so on.

A feature of the cable cutter is the snap-action hold-down which permits size adjustments to be made with a flick of the finger. The cable to be cut is inserted

Improved Tap Head Makes TAPS LAST LONGER!



The unique friction clutch on this new, improved Procunier high speed tapping head practically "thinks" for the operator . . making taps last longer, cutting production time and cost. This double-cone clutch engages the drive and reverse shells with a velvety "cushioned" action. Tap driving power is *automatically regulated* by the amount of pressure applied to it. "Blind" tapping is done as easily as through tapping. The operator can quickly *detect dull or "loaded" taps just by the pressure needed to drive them.* This increased sensitivity and smoothness results in: fewer broken taps; less operator skill needed, faster, lower cost tapping! This improved Procunier tapping head has many more time and money saving features. *Write today.*

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Safety Chuck Company
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PROCUNIER SAFETY CHUCK CO.
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Gentlemen:

Please send your illustrated brochures which give complete prices and specifications on Procunier High Speed Tapping Heads and Machines.

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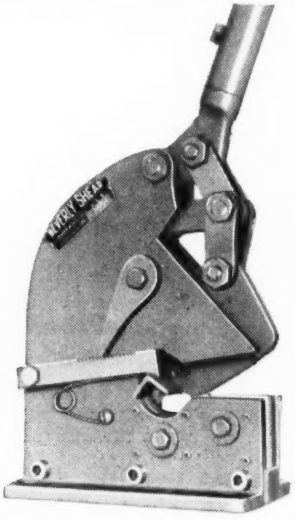
PROCUNIER "TAP SAVER"

Exclusive "Tru-Grip" tap holder, lighter, smaller in diameter, minimizes "flywheel" effect. It affords easier tapping close to walls or shoulders, eliminates "chewed up" tap shanks.

between the blades and the spring tensioned hold-down arm with the V-block hold-down at its end is pushed down by the operator, permitting a dog to drop into notches cut into the arm, thus holding the cable firmly for the cut. To release the hold-down, the operator depresses the arm slightly to disengage the dog from the notch.

Minimum effort is said to be required to cut even the heaviest cable due to a double linkage arrangement which compounds the downstroke utilized in the cutter. To prevent the double linkage from collapsing or folding, a center bar, hinged at the back of the frame, is attached at the knuckle of the links. The blades of the cutter are adjustable to compensate for wear and resharpening, and all parts are interchangeable in case replacements are necessary.



Beverly Cable Cutter

Lightweight Pallet Truck

Expendable four-way corrugated paper pallets having large cylindrical supporting columns are said to be readily handled with the lightweight pallet truck shown herewith, product of the Lyon-Raymond Corp., 2536 Madison St.,

D & M AUTOMATIC PRESS GUARD

No Springs • No Cables • Fits Any Machine • Low Initial Cost • Low Maintenance •

• This punch press guard meets the most exacting standards of safety engineers and safety laws. Permits operator to feed the press without hindrance.

Write for complete information.

Price Range $24 to $32

D&M GUARD Co.

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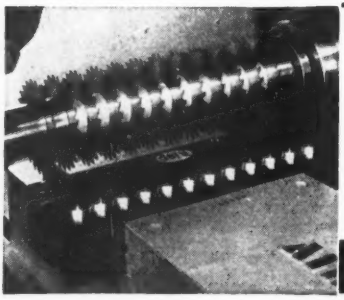


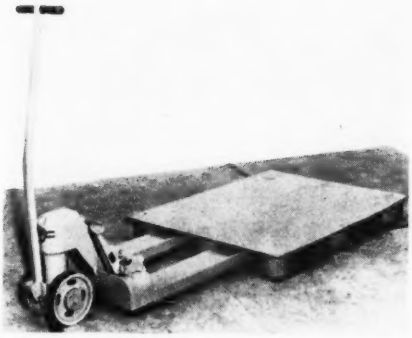
New Equalizing Gang Vise

FASTER • CHEAPER • MILLING and GRINDING

THE DERY GANG VISE consists of a solid jaw and a body which holds a series of equalizing pads or blades. The solid jaw is locked to the body with screws and the work inserted. The "V" grooves and the equalizing pad thus form a three point chuck for each piece of work. The pads and grooves of solid jaw are the same width as the diameter of the work.

WRITE FOR COMPLETE DETAILS

dery TOOL & DIE CO., PINE MEADOW • CONN.



Lyon-Raymond Lightweight Pallet Truck

Greene, N. Y. Each fork of the truck is 6 inches wide with a 10-inch opening between the forks, thus providing an overall width of 22 inches.

Other features of the truck include rubber-tired front wheels, handle hold-up, foot pump with separate pedal release, and friction brake that engages the floor when the towing handle is held in the "down" position. The capacity of the truck is 2,000 lb. The unit has a lowered height of 3¼ inches and an elevated height of 7¼ inches and can also be operated in standard double-face wooden pallets.

Continuous Width Gage

To assure uniformity of diameter or width in the production of round or flat wire, bare or insulated, Pratt & Whitney, Division of Niles-Bement-Pond Co., West Hartford 1, Conn., has announced a "magnetic" continuous width gage which is designed to indicate the diameter or width of a continuous roll of wire or thin strip material as it is being processed.

Identified as the Model B, the unit consists of a gage head, slide base, meter, and power unit. The gage head has two gaging rolls which are in continuous contact with the wire or material as it passes through the unit. The wire is guided through the gaging rolls by two leveling rolls under tension which flatten out the material and control the pass line so that a true measurement is indicated. Any variation in diameter or width from the predetermined setting is greatly magnified electrically and shown on the indi-

MAKES *Tough* SET-UP *Jobs* EASY

The tougher the set-up is on tapping and reaming jobs, the more you will appreciate Ziegler Floating Tool Holders — because the Ziegler makes it possible to turn out perfect work even though the set-up itself may not be perfect.

The secret lies in the fact that the Ziegler Holder compensates for inaccuracies in set-up even though they amount to as much as 1/32" on the radius or 1/16" on the diameter.

Over-size and bell-mouthed holes will become a thing of the past when you discard your ordinary tool holders and change over to the Ziegler. This has been the experience of thousands. Try it and see for yourself!

Types to fit any machine used for tapping or reaming

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

W. M. ZIEGLER TOOL CO.

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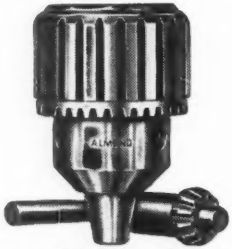

Maximum Gripping Power with Extreme Accuracy and Long Life.

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T. R. Almond Mfg. Co.

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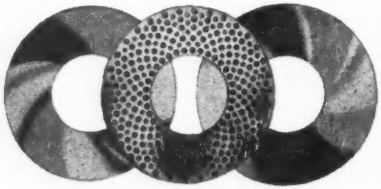


FLAT RACE BALL THRUST BEARINGS

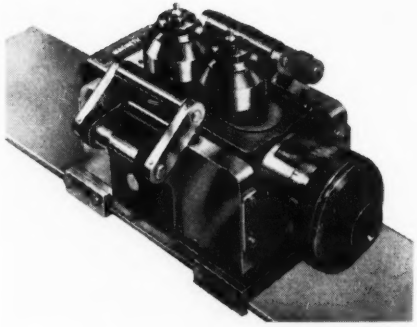
WITH BRONZE RETAINERS

These bearings range from ½" to 3½" shaft diameter; from 1-7/32" to 5-7/32" outside diameter. Larger sizes can be made to 25" outside diameter.

Send us your blueprints

ACORN BEARING CO.

NEW BRITAIN **CONNECTICUT**



P & W Model B "Magnetic" Continuous Width Gage

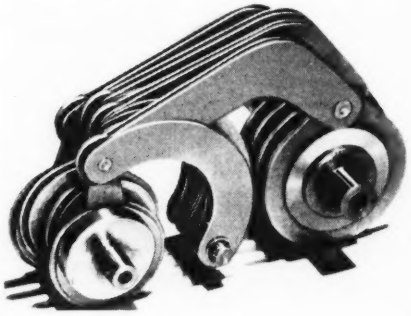
cating meter so that the operator knows instantly when the material is under or over the specified measurement and can immediately make adjustments to correct it.

The gage is set directly to the required measurement by a micrometer dial, no masters being required, and can be used with a control meter to signal the operator or to automatically make corrective adjustments to maintain the predetermined measurement.

Speed Control Device

Known as the "Zero-Max," a speed control device which is infinitely variable from zero to maximum has been announced by Revco Inc., Dept. MMS, 405 Thorpe Bldg., Minneapolis, Minn. A torque conversion structure, the device

Internal Mechanism of Revco "Zero-Max" Speed Control Device



features an operating principle that involves the use of crank motion on the input shaft, creating linear motion which is absorbed on the output shaft by a series of one-way overriding clutches. A leverage mechanism is placed between the two shaft structures for infinitely varying the length of the stroke from zero to maximum, providing an infinite speed variation from zero to 4 to 1 ratio.

The principal advantages claimed for the Zero-Max are that it is compact; can be mounted in any position; provides a level flow of power; has instant response to change of speed which can be made either while the device is operating or stopped; excellent low speed as well as high speed performance; high starting torque; silent operation, and so on.

Cutoff Wheel

Specially designed for use on bench saws, portable saws, bench grinders, and other high speed machine shop equipment, a general purpose cutoff wheel designated as the "MX" has been developed by The Carborundum Co., Niagara Falls, N. Y. Said to quickly produce smooth cuts and fine finishes on all types of steel, angle iron, aluminum, brass, bronze, copper, asbestos, brick, and concrete, the wheel, it is claimed, is resilient and will not shatter due to its composition, which consists of keen-cutting abrasive grain (aluminum oxide for use on metals, silicon carbide for work on non-metallic materials) impregnated in tenacious cotton fiber and a strong resin bond.

The wheel is available in 6, 7, 8, 9, and 10-inch diameters and in grit sizes of 24 and 60.

In-Line Master Valve

A unique type of valve installation centered around Full-Flo master valves is announced by the Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich. The installation provides for the placement of 3-way master valves (A&B), one normally open and one normally closed, at each end of the cylinder (D).

CAMPBELL #15
a NEW ABRASIVE CUTTER at a NEW LOW PRICE*
● Choice of wet or dry model.
● Capacities up to 1" solid —2" tubing.
● Cuts tubes, bar and angle stock, etc. of corrosion-resisting steels—annealed or unannealed—non-ferrous materials.
*Wet Model $600 (without Electrical Equipment)
Dry Model $550 (without Electrical Equipment)
SEND FOR BULLETIN DH-102C
This illustrated folder gives you complete specifications, dimensions, shipping weights and other data about this new Campbell Abrasive Cutter. Write for your copy.
CAMPBELL MODEL 15
ACCO
CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE
931 Connecticut Avenue, Bridgeport 2, Conn.
See Us at Space No. 925 at the Metal Show

Operation is effected by a conveniently located, small pilot valve (C) which can be manually, mechanicaly, or electrically actuated. This arrangement permits the elimination of the long lengths of large diameter pipe between the valve and cylinder which had to be filled and exhausted with non-productive air. They are replaced by short connecting lengths (F). Air supply is received by the pilot valve and dispatched to the master by means of tubing (E&G).

The close coupling of the valve to the cylinder is said to increase production since it permits quick exhaust-dumping

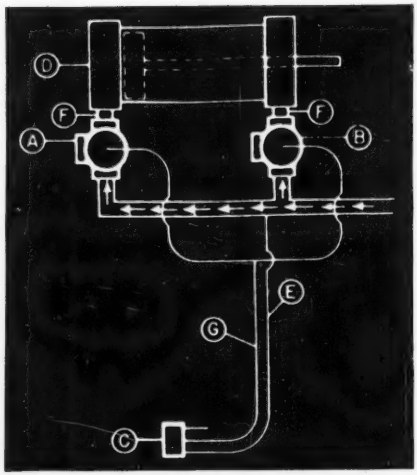


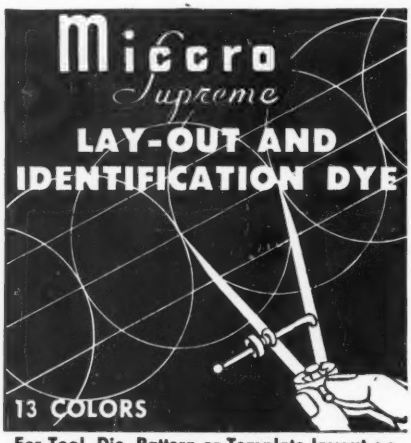
Diagram of Valve Installation Involving Ross In-Line Master Valves

and consequent fast movement of the cylinder piston. Other advantages include easy operation of the smaller pilot controlling the valve. The new mounting method is claimed to be especially advantageous with valves of ½ inch or larger, or with smaller sizes where increased operating speed is required.

The master valve is available in ¼ through 1¼-inch sizes, straightway or 3-way, normally open or closed. For short-stroke double-acting cylinders, 4-way master units can be supplied.

Hand Grinder

Designed to operate on 110-130 volts, alternating or direct current, at a speed of 38,000 r.p.m., the "Roto-Master" Hi-



For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheet, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for trial sample and circular.

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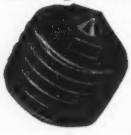
A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in 3/16" to 1" diameters. *Send for price list.*

HEIMANN MFG. CO.
330 Lincoln Ave. Urbana, Ohio

"Roto-Master" Hi-Speed Grinder

Speed Grinder illustrated herewith, product of the Metal Removal Co., 1014 N. Ashland Ave., Chicago 22, Ill., is said to provide for economical, rapid, and accurately controlled metal removal using carbide burrs or rotary files or mounted wheels. The grinder is powered by an air-cooled motor that is cooled by an air stream with a velocity of 5,400 cubic feet per minute.

Designed for finger-tip control, the Roto-Master weighs 12 oz. and measures 6¾ inches in length. Outstanding features include a simple operating wrenchless collet type chuck and sealed micro-precision ball bearings, lubricated for the life of the tool. Collets are interchangeable for 3/32 and 1/8 inch.

Lathe Collet Chuck

A unique spindle nose lathe collet chuck which is designed to provide a high degree of accuracy together with unusual gripping power has been announced by The Jacobs Mfg. Co., West Hartford 10, Conn. An outstanding feature of the chuck is a newly developed Rubber-Flex collet which consists of special Hycar synthetic rubber bonded and mechanically locked to hardened and ground tool steel jaws. The collet is available in various sizes, each having a full 1/16-inch gripping range, and only eleven of the collets are said to be required to chuck any bar between 1/16 to 1 3/8 inches in diameter.

The handwheel of the chuck is solid aluminum, and all working parts of the unit are of alloy steel, hardened and ground. The chuck body is an alloy steel forging, hardened and ground. The simple construction is said to make the chuck

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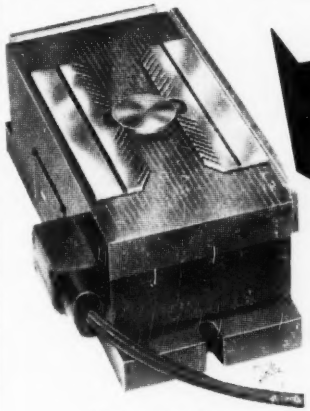

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Your Magnetic Chuck and Magna-Vise* will hold the job on any rigid type non-magnetic material. Write today for complete details.

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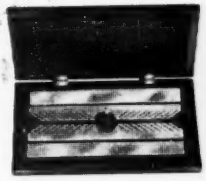
MAGNA-LOCK CORP.

Magnetic Chucks and Devices

Dept. MM-109 Big Rapids, Michigan



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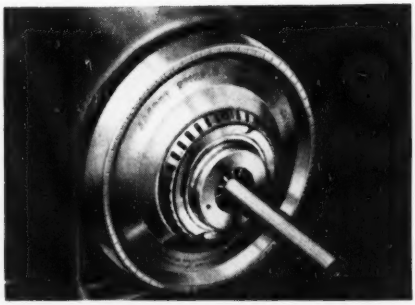


Jacob Spindle Nose Lathe Collet Chuck with Collet in Place

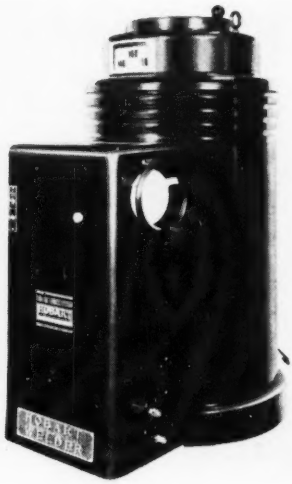
easy to dismantle and assemble, maintaining the original accuracy without the need for careful realigning. A special impact mechanism locks the work in place (or frees it) with a few sharp impacts administered by quickly rotating the handwheel.

The chuck is available in models for camlock, taper key drive, American Standard, and threaded spindles.

Inert-Gas Shielded Welder

For inert gas welding, the Hobart Bros. Co., Hobart Square, Troy, Ohio,

Hobart Model TIH-200-S A. C. Welder

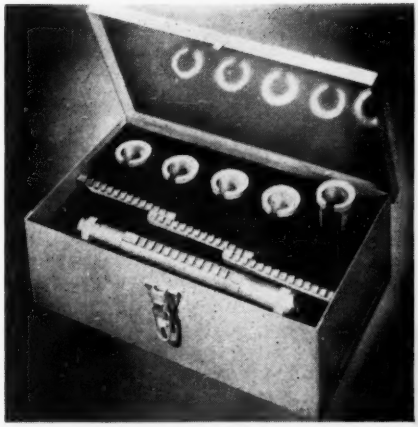


has brought out the Hobart Model TIH-200-S A.C. Welder as shown herewith, which features supplementary low heat control. The unit is so equipped that it can be used either as an ordinary transformer type welder or, with the special features switched on, for inert-gas shielded welding. In addition, the unit is equipped for unusually fine results in work requiring extremely low current values.

The low heat control is accomplished by means of a secondary reactor built in and controlled by a handwheel located on the side of the case. The reactor can be switched on or off at will.

Broach Kit

The Kase Machine Co., 1843 Buffalo Ave., Cleveland 19, Ohio, has announced the availability of a packaged-unit broach kit which is designed to facilitate keyway cutting in a wide range of bore diameters. The standard (SB-50) broach kit illustrated consists of a 1-inch diameter Glenny broach, four interchangeable cutting blades, five eccentric bushing-type adapters, and a sturdy metal carrying case. The blade widths in the SB-50 kit are $\frac{3}{8}$, $\frac{1}{4}$, $\frac{5}{16}$, and $\frac{7}{16}$ inch, and

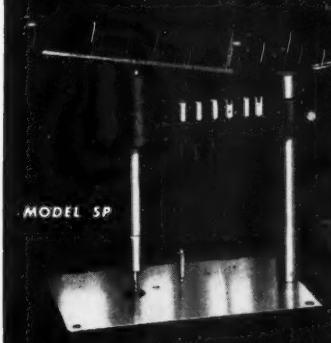


Glenny Broach Kit

the eccentric adapters permit keyway cutting in bores $1\frac{1}{8}$, $1\frac{5}{32}$, $1\frac{3}{16}$, $1\frac{7}{32}$, and $1\frac{1}{4}$ inches in diameter.

The Glenny Broach Kit is available with standard $\frac{3}{8}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, or $1\frac{1}{4}$-inch diameter broaches. The quick, simple ad-

ONLY $39.50 BUYS THIS PARAGON PRECISION HAND TAPPING MACHINE



Anyone can tap dies and fixtures faster; better and more economically with this precision tapping machine that gives new accuracy in hand tapping, and eliminates costly tap breakage. Equipped with seven adaptors, 8/32" to ½" (taps not furnished). Table to tap height from 0" to 9". Precision ground surface plate 13" x 8".

Territories open for Dealers and Manufacturers Representatives.

Write today for complete information.

- *Eliminate Costly Tap Breakage.*
- *Speed Up Tool Room Tapping.*
- *Model DR For Drill Press Column Installation. Only $29.50.*

PARAGON METAL PRODUCTS CO.

8619¼ West Third Street — Los Angeles, California

justment feature of the Glenny broach permits keyways of infinitely variable depths to be cut with one broach. The 1-inch broach in the SB-50 kit can be used to cut keyways ranging from 0.030 to $\frac{5}{8}$ inch in depth. Keyway depth is controlled by means of end nuts which move the blade back and forth in a taper-milled slot in the broach body. Once the blade has been properly set, the end nuts are hand-tightened to lock the blade positively in position for precision production operations.

The Glenny Broach Kit includes a durable metal carrying case which is equipped with a catch. The case is finished in a metallic gray and has wood inserts which protect the tools and keep them readily accessible.

Cushion Cylinder

The Gerotor May Corp., Dept. MMS, Baltimore 3, Md., has announced an improved type of cushioning for its Series 100 cylinder of 150 p.s.i. air and 300 p.s.i. oil capacity. The new design provides for effective cushioning of the piston stroke by compression of displaced air or fluid.

The Gerotor Cushion Cylinder is a standard cylinder employing cushion units. A cushion plate attached to the cylinder cover blocks off the flow of exhaust air or fluid when a cushion bushing attached to the piston rod enters this mating cushion plate. The air or fluid displaced by the movement of the piston is thus compressed and metered out through adjustable needle valves, thereby cushioning the piston during the remainder of the stroke.

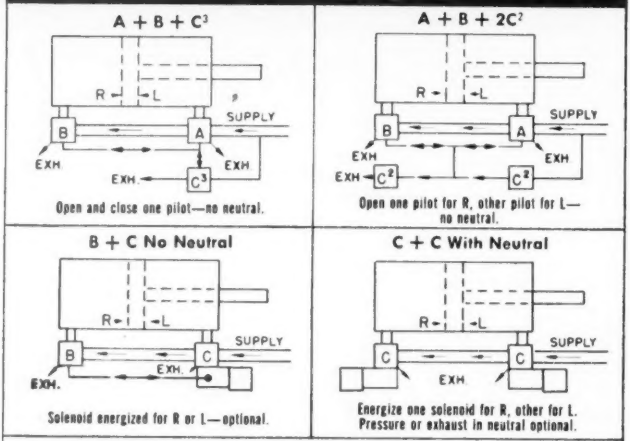
One needle valve, located in the blind end cover, controls the speed of the cushioning stroke when the piston rod is retracting. The other needle valve, located in the rod end cover, controls the speed of the cushioning stroke when the piston rod is extending. Two check valves built into the cushion plates permit unrestricted flow of pressure into the cylinder.

The Gerotor Cushion Air Cylinder may be ob-

SOLVE AIR PROBLEMS

Easy as A, B, C - -

WITH UNITIZED CONTROL



A = L3A Numatics Valve
B = L3B Numatics Valve
C = SL3 (L3A with solenoid pilot attached)
C² = Two-way pilot valve
C³ = Three-way pilot valve

Shown here are a few typical combinations obtained with "Unitized Control" . . . applied directly to the air cylinder.

INCREASE PRODUCTION —LOWER COSTS

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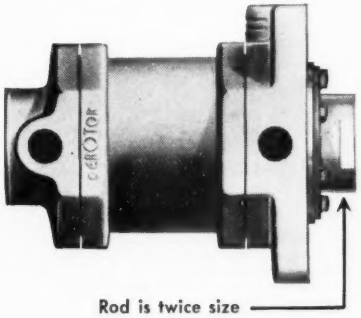
NUMATICS

100 SOUTH MAIN ST. • MILFORD, MICH.

tained with cushioning on both ends of the cylinder or with cushioning on either end only. Air cylinder bore sizes in which cushioning strokes may be ob-



Gerotor Cushion Cylinder

tained are 1½, 2, 2½, 3, 4½, 6, 8, 10, and 12 inches. Each of these sizes may be obtained in rabbet, foot, trunnion, center line, blind end flange, rod end flange, and clevis mountings.

Surface Plate and Accessories

A heavy cast iron surface plate for laying out work, checking flat surfaces, and general toolroom and shop use is now available from the South Bend Lathe Works, 386 E. Madison St., South Bend 22, Ind. The plate, which is 12 x 17 x 3 inches in size with ¾-inch thick top, is made of special quality close-grained iron having a high resistance to wear, and is heat treated to prevent distortion. The surface is precision ground, and all edges are accurately machined. The bottom is heavily ribbed and has three-point support.

Toolmaker's V-blocks available for use with the surface plate are made of hardened steel with all surfaces precision ground. The blocks are supplied in matched pairs only. Each block is 2⅛ inches wide x 1⅛ inches high x 2¼ inches long and has a clamp with knurled screws which are cross drilled for tightening with a rod. The blocks have a capacity for round work from ¼ to 2 inches in diameter.

Also available for use with the surface plate is an angle plate which is precision ground on 6 sides. The angle plate, which is 3¼ x 3¼ x 4¼ inches in size with ⅝-inch V-groove, serves as a square for

Hoglund Contour Wheel Dresser

Hydraulically controlled from a 10:1 template. It dresses not only radii and angles but continuous contours across the wheel.

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HOGLUND ENGINEERING CO., Inc.
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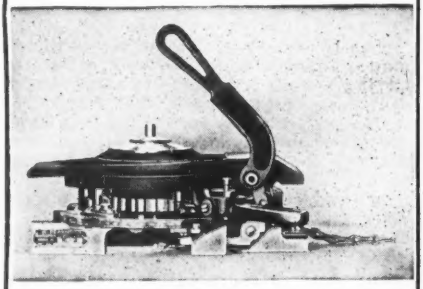
AUTOMATIC CHUCKING AND INDEXING FIXTURE



1.—1800 light cuts per hour.
2.—Either horizontal or vertical position.
3.—Collets changed instantly.
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Model D—Ratchet indexing only—1" cap.
Model E—Both degree and ratchet indexing —Capacity up to 1".
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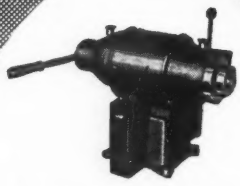

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POLISH • LAP • DE-BURR
Small Metal and Plastic Parts Better, Speedier, at Low Cost

For the type and size designed to meet your particular needs

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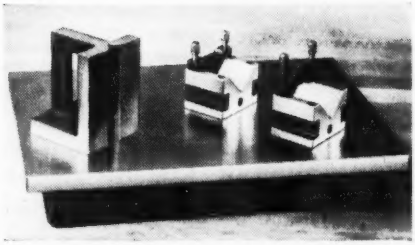
Schauer Manufacturing Corp.
Originators of Today's Speed Lathes
2060 Reading Rd., Cincinnati 2, Ohio



South Bend Surface Plate, V-Blocks, and Angle Plate

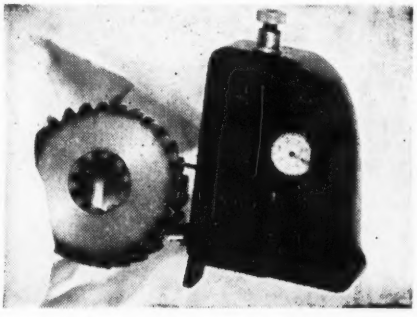
laying out and setting up work and is said to be ideal for checking and finishing right-angle surfaces.

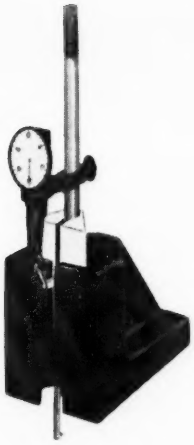
Gear Measuring Instrument

The Urbauer Engineering Co., Naperville, Ill., has announced that its "Gearmaster" Gear Measuring Instrument for checking all conditions in spur, helical, and herringbone gears is now being produced with a body made from Invar which contains from 35½ to 36½ per cent of nickel steel so that there is very little or no expansion up to a temperature of 400 deg. F. Consequently, the accuracy of the instrument is claimed to be unaffected by heat in gaging gears in or out of machines or other equipment regardless of the temperature of the gears.

According to the manufacturer, the improved Gearmaster may be readily used in accurately determining tooth spacing, tooth thickness, chordal spacing, tooth form, pitch diameter, diametral

"Gearmaster" Improved Gear Measuring Instrument





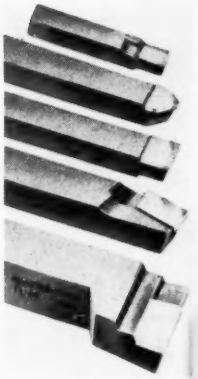
Tietzmann Model No. 1 Die Checker

pitch, backlash allowance, and possible mandrel runout in spur, helical, herringbone, or internal gears, as well as in silent or roller chain sprockets.

Die Checker

Designed to provide an efficient method of checking tapers on dies without the use of other instruments, the Tietzmann Model No. 1 Die Checker shown herewith has been placed on the market by the Tietzmann Tool Corp., 318 N. Main St., Englewood, Ohio. Recommended for all types of die shops, as well as for toolmakers, the unit has a 1-inch travel and is made of high grade tool steel which is hardened, ground, and lapped to a tolerance of ± 0.0001 inch. The base of the checker measures 1⅝ inches wide x 2 inches deep x 2 inches high.

Stress Relieved Carbide-Tipped Tools



Nelco Stress Relieved Carbide-Tipped Tools

A line of carbide-tipped lathe tools with slash milled design that is claimed to eliminate brazing strains is announced by the Nelco Tool Co. Inc., Manchester, Conn. Larger sizes are brazed with a nickel or constantan shim between brazed surfaces to minimize strains. The tip of each tool overhangs the steel shank to allow for several regrinds before steel must be ground.

The tools are manufactured in all

American Drill Bushing's NEW HOME
AMERICAN DRILL BUSHING CO., INC.
LARGER QUARTERS • BETTER FACILITIES • QUICKER SERVICE
The increasing demand for our products has made this expansion necessary. In our new modern building, additional equipment and personnel plus time-saving methods are all devoted to the exclusive manufacture of the highest quality drill jig bushings. Room for increased stock is provided to supply our exclusive distributors throughout the U.S. and Canada. These distributors maintain complete stocks of American Drill Bushings for immediate free delivery.
THE STANDARD OF COMPARISON FOR QUALITY AND ACCURACY
American Drill Bushing CO., INC.
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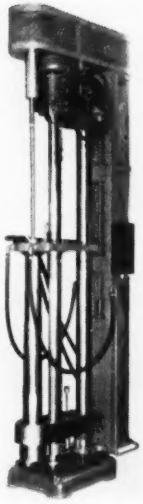
SPECIALIZING ONLY IN DRILL BUSHINGS

standard grades of carbide and are available either milled and brazed (user finish grinds tool) or finish ground.

Feed Unit for Surface Hardening

Lepel High Frequency Laboratories, Inc., 39 W. 60th St., New York 23, N. Y., has introduced a progressive feed unit for the fast surface hardening of shafts, bars, lead screws, and fabricated parts up to 5 feet in length and 3 inches in outside diameter. Designated as the P 60, the unit may be used for either the continuous hardening of entire lengths or for selected areas of the workpiece. The depth of hardness is controllable simply by regulating the speed of travel of the work coil. The unit may also be used for progressive soldering or brazing seams and joints.

The P 60 progressive feed unit is designed to operate on a standard three-phase power supply and is intended for use in conjunction with Lepel high frequency heating equipment but can also be used with other makes of high frequency heating equipment. The unit can be continuously operated either automatically or by means of a foot type switch.



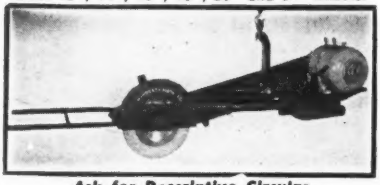
Lepel P 60 Progressive Feed Unit

Diagonal Cutting Pliers

A diagonal cutting pliers in 6 and 7-inch sizes is being manufactured by J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y. Special high carbon steel is used in drop-forging the pliers. In addition to hardening and tempering, the jaws receive a second hardening by electronically controlled heat treatment.

Cutting edges are precision machined and hand sharpened to an edge which

MUMMERT-DIXON SWING FRAME GRINDERS
Sizes 12", 14", 16", 18", 20" and 24" wheels.



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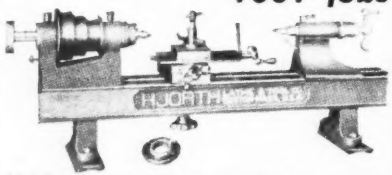
120 Philadelphia St. • Hanover, Pa.

. . . for more than 1001 jobs



HJORTH LATHE & TOOL CO.
8 BEACON STREET WOBURN, MASS.

THREE SIMPLE STEPS

Remove broken taps with WALTON TAP EXTRACTORS as fast as 1, 2, 3. First, slide fingers into flutes of broken tap. 2. Adjust holder and sleeve to the work. 3. Apply tap wrench and back out the broken tap.

Economical; time saving; tested and proved for years in all kinds of shops. See your dealer or write us for Folder No. 10 and details of free trial offer.

THE WALTON COMPANY • **Hartford 10, Conn.**

Williams Diagonal Cutting Pliers

is said to offer the maximum in cutting ability consistent with long wearing, non-nicking characteristics. Unusually large diameter rivets are claimed to assure smooth action without distortion over a long period of use even when cutting the heavest wire.

The pliers has a luster-black protective finish, with faces and edges of jaws polished bright.

Manganese Steel Welding Electrode

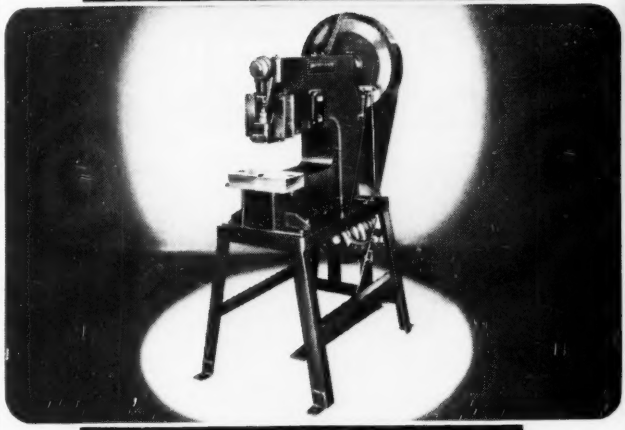
Designed for use with alternating or direct current, an electrode for welding manganese steels is now being manufactured under the trade name of EutecTrode 4/49 by the Eutectic Welding Alloys Corp., Dept. P, 40 Worth St., New York 13, N. Y. According to the manufacturer, the electrode produces long-life welds on manganese steels without cracking, withstands high impact, and has a Rockwell hardness of C 26-34, increasing as it work hardens.

In addition to use in welding manganese steels, EutecTrode 4/49 can be employed for overlaying work. The electrode is available in sizes of $\frac{3}{16}$, $\frac{5}{32}$, and $\frac{1}{8}$ inch. A companion rod for torch welding (EutecRod 3) is available in sizes of $\frac{3}{16}$ and $\frac{1}{8}$ inch.

Punch Press Safety Guard

A universal punch press safety guard which can be easily installed on any straight side or inclinable punch press is being offered by the Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7,

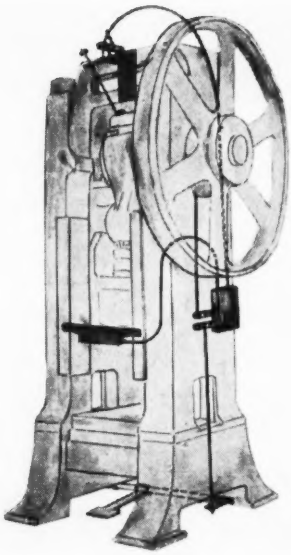
WHITNEY METAL
TOOL COMPANY
39 YEARS EXPERIENCE



WHITNEY-JENSEN
Nos. 129 - 130
DEEP THROAT POWER PUNCH PRESSES
These efficient presses feature: high speed, deep throats, all steel welded frames, inexpensive auxiliary attachments, various punches and dies from stock. They have a 5-ton safety factor.
Throat Depths — 12" and 18"
Capacity — 10 tons
WHITNEY METAL TOOL COMPANY
110 FORBES STREET, ROCKFORD, ILLINOIS

Minn. According to the manufacturer, the guard enables the operator to place his hands in the working zone of the press during the work cycle, which can be started only by placing both hands on the safety guard levers. After the press passes through one work cycle, a non-repeat mechanism automatically locks out repeated cycling of the press. Complete freedom is said to be assured since the tripping mechanism in no way obstructs the working area or vision at the point of operation.

The non-repeat mechanism provides one-stroke operation. Should this mechanism become jammed for any reason, the overall tripping mechanism of the press is automatically locked out and the press, it is claimed, cannot be put through its work cycle until the safety device is placed back into working order.



Dayton Rogers Punch Press Safety Guard

GRAY TURRET HEAD METAL CUTTER OR NIBBLER

N.A.M. Pioneer Award Given to Gray

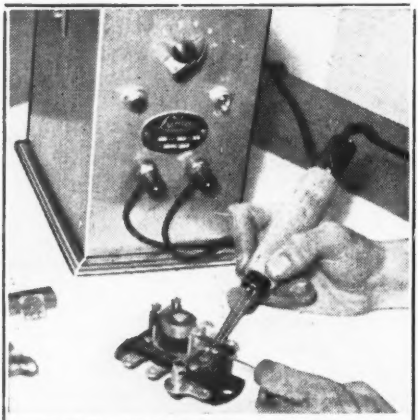
Most modern Nibbler for Template Cutting, Tool Rooms, Shipbuilding, Aircraft Parts, Aircraft Tubing, Sheet & Plate Shops.

GRAY MACHINE CO.

Box 596, Philadelphia, Pa.

Tapping and Drilling Head

Known as the "Tapordril," a sturdy, high speed driving unit designed for drilling or tapping two or more holes on close center work is being marketed by



FOR FASTER, SAFER SOLDERING

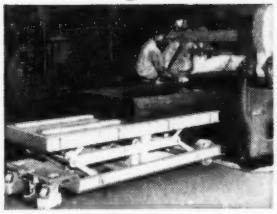
The Luma resistance method of soldering is the accepted way for small shops requiring single operation to large plants with many types of operations. Write for complete information about this remarkable tool.

LUMA ELECTRIC EQUIPMENT CO.

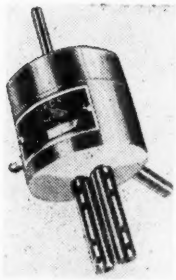
P. O. Box 132-M.S. Toledo 1, Ohio

LYON - Raymond

SHEET FEEDING and DIE HANDLING TABLES



LYON-Raymond Corporation 3918 Madison St., Greene, N. Y.



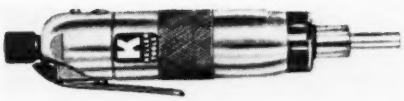
"Tapordril" Tapping and Drilling Head

L. E. Ottney & Co., 3650 W. 11 Mile Rd., Box 469, Royal Oak, Mich. Used in a drilling or tapping attachment, the unit is said to provide an efficient and economical means of drilling, reaming, tapping, or countersinking.

The Tapordril is available in two models; namely, Model F which may be obtained with fixed centers from ⅜ to ½ inch, and Model R which may be obtained with fixed centers from ⅜ to ¾ inch. The Model F operates in the same direction as the driving spindle, while the Model R operates in reverse, since it utilizes no idler gear. The gears of both models are specially cut from alloy steel, and the housings are of high quality bearing material.

Pin Riveter

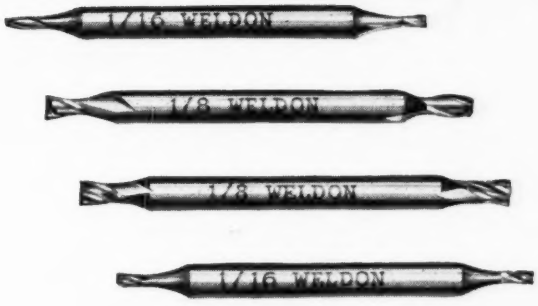
The Keller Tool Co., Grand Haven, Mich., announces a pin riveter for very light riveting operations with soft-metal tubular and standard rivets. The riveter is said to be well suited to a variety of special jobs, such as setting small drive screws, drive brads in the assembly of metal toys, and light peening and scaling operations on thin sheet-metal sections.



Keller Pin Riveter

The net weight of the riveter is 13 oz. and the length, 6⅛ inches. The piston diameter is 19/32 inch, and the stroke is ⅛ inch. The tool has a speed of 9,000

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON

Stub Length Double-End End Mills

***NEW!*—Stock Items**

A new line of small double-end end mills, with flutes shorter than regular, offer these advantages:

GREATER STRENGTH • LONGER TOOL LIFE
FAR LESS BREAKAGE • FASTER FEEDS

Same high Weldon quality in 2- and 4-flute styles.

For complete list send for Folder No. STM-1

THE WELDON TOOL CO. Cleveland, Ohio

3000 WOODHILL ROAD

blows per minute. Standard equipment consists of one blank rivet set, with special rivet available on order to meet specific requirements.

Socket Clamp

The Vimco Mfg. Co., 111 Brayton St., Buffalo 13, N. Y., announces a socket clamp designed for use with all standard medium base sockets. The clamp consists of two identically formed rings of heavy gage steel, one of which fits over the socket cap while the other slides over the socket shell until it rests on the

Illustration Showing Vimco Socket Clamp in Assembled Position

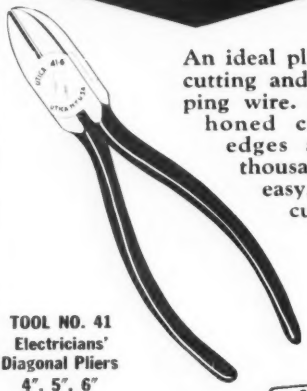
socket shoulder. Two machine screws are used to clamp the rings together, thus eliminating the hazards of broken sockets, it is claimed. The clamp is cadmium plated for long-wearing corrosion-resistant service.

Magnetic Starter

The Arrow-Hart & Hegeman Electric Co., 103 Hawthorne St., Hartford 6, Conn., announces the adoption of Plaskon Alkyd, a polyester type resin com-

U TI CA

UTICA TOOLS
For More Tool Mileage



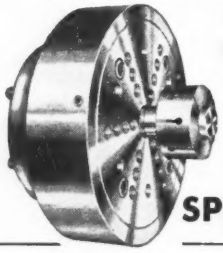
An ideal plier for cutting and stripping wire. Hand-honed cutting edges assure thousands of easy, clean cuts.

TOOL NO. 41
Electricians' Diagonal Pliers
4", 5", 6"

SEE YOUR DEALER

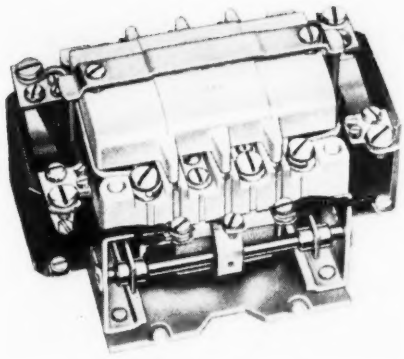
UTICA DROP FORGE & TOOL CORP.
UTICA 4, NEW YORK

Why did one manufacturer of precision gears purchase
17 SPEEDGRIP PRECISION INTERNAL CHUCKS?
Because he could produce BETTER gears CHEAPER!



The SPEEDGRIP PRECISION INTERNAL CHUCK gives extreme accuracy and speeds up production on second operation work. MONEY-BACK guarantee. Layouts made if prints are submitted. *Send for descriptive folder today.*

SPEEDGRIP CHUCK, INC. 1102 W. Beardsley Ave. Elkhart, Indiana



Arrow-Hart "RA" Magnetic Starter

pound, for use in molding bases and protective hoods for its Arrow-Hart "RA" Magnetic Starters. According to the manufacturer, the compound has an unusually high arc resistance, does not support combustion, affords a hard and durable surface which resists abrasion, has a high solvent and chemical resistance, and provides ideal dimensional stability.

Since the material is not affected by organic solvents, fats, oils, acids, and water, it is believed that its use will permit the installation of starters in locations formerly considered detrimental to the operation of normally protected equipment.

Expansion Chucking Reamer

Described as an ideal high production tool, an expansion chucking reamer available in sizes from ½ to 3 inches with straight or taper shanks is being marketed under the trade name of "Flex-Rite" by the Union Twist Drill Co., Butterfield Division, Derby Line, Vt. The reamer consists of high speed tool steel blades brazed into a high strength alloy steel body which is designed to absorb shock and other stresses. The expanding feature permits the reamer to be resharpened many times and still maintain the original size.

When the blades become dull from long service, they need only to be expanded by means of the socket head adjusting screw of the reamer and reground to original size. Use of a socket head type of adjusting screw allows for reaming to

MAX-WELL-MADE
E-Z SET
BORING AND FACING TOOLS

- 6 STANDARD SIZES
- INTERCHANGEABLE SHANKS
- TOOL STEEL CONSTRUCTION
- CAPACITIES UP TO 20 INCHES
- BORING BARS UP TO 1½ INCHES
- FINE MICROMETER ADJUSTMENT
- PRICES INCLUDE SHANK AND BARS

WRITE FOR CATALOG NO. 3040

THE MAXWELL CO.
327 BROADWAY • BEDFORD, OHIO

PIONEER
TWO-SPEED ALL PURPOSE DRILL

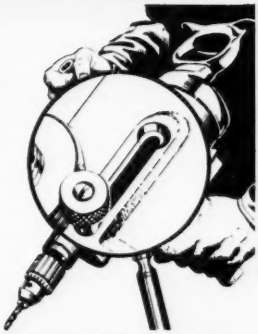
Gear Shift . .

permits change from low to high speed while in operation.

reduces number of drills needed.

operates from 1/4" to 5/8" in steel; 1/4" to 1 1/4" in wood.

combines speed and power in one drill.

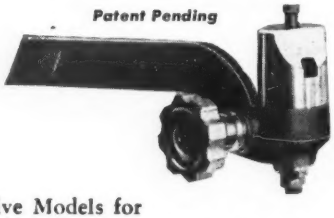


A 3/8—5/8 INCH HEAVY DUTY FULL-BALL BEARING DRILL

LOUISVILLE ELECTRIC MANUFACTURING CO.
3000-30 MAGAZINE STREET
LOUISVILLE 11, KENTUCKY

Monarch Precision
SHAPLANE
Radius Tools

Patent Pending



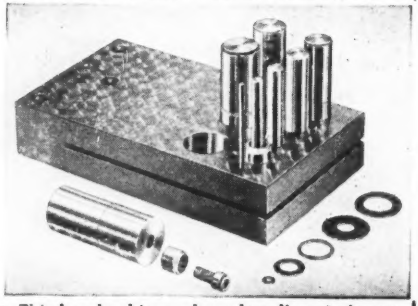
Five Models for

LATHES, SHAPERS, PLANERS, AND BORING MILLS.

RANGE ½" TO 3" RADIUS (MODELS ALSO AVAILABLE FOR CONVEX CUTTING, AND CONCAVE RADII TO 6" ON PLANERS, ETC.)

C. B. TEETER
Tool Room Specialties
4470 Oakenwald Ave., Chicago 15, Ill.
Phone Drexel 3-3571

MAKE WASHERS AND SHIMS
Up to ⅛" Thickness
IN STEEL—PLASTIC—MICA—RUBBER, ETC.



This handy shim and washer die set pierces the thinnest of shim stock or up to 1/16" through mild steel, without burring. Punch sizes are 3/16" to 1" in 1/16" or ⅛" graduations. 28 washer combinations. Made of high grade tool steel hardened and drawn to withstand shock without breakage. **$39.50 per set. Write for complete specifications. Finished Wooden Case $4.75 extra.** When ordering specify ⅛ or ⅛ graduation.

DAVIS & LARRICK MFG. CO.
Box 191, Route No. 2, Dayton 10, Ohio

Butterfield Expansion Chucking Reamer

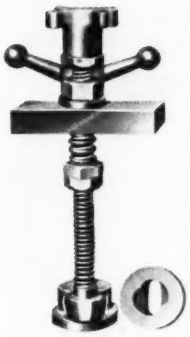
the bottom of blind holes and also facilitates regrinding of blades between centers.

Drill Chuck

Supreme Products, Inc., 320 E. 21st St., Chicago, Ill., has announced improvements in its "Hand-Lock" Chuck for drills, which is available in both a serrated and knurled model, each having the same capacity of ¼ inch and each made in the following sizes: ⅜-24 thread, ½-20 thread, and ½-24 thread. According to the manufacturer, the chuck is designed to close firmly and open easily with light hand pressure, thus preventing drill slippage caused by insufficient tightening. Since drills are gripped tightly, the chuck, it is claimed, will not slip or jam while drilling under heavy loads.

Other outstanding features of the improved chuck include jaws of hardened alloy steel and complete plating of all parts to resist rust.

Supreme Improved "Hand-Lock" Chucks



Morton Fixture Clamp

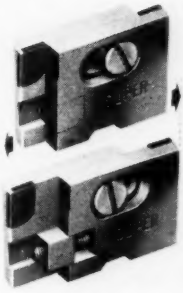
Fixture Clamp

Morton Machine Works, 2421 Wolcott St., Detroit 20, Mich., is offering a fixture clamp designed for clamping a casting through a bored hole onto a pilot plate. Clamping is effected by means of an alloy T-bolt engaging a hardened insert which is furnished with the clamp. The insert is ground for a press fit in the bottom of the pilot plate.

The T-bolt can be cut off to suit any height of job. In addition, the hand knob used as handle can be adjusted to suit. The spherical collar nut or steel ball handle used for tightening is optional equipment. The lock nuts and spring provided can also be adjusted for height and prevent the clamp strap from dropping to the bottom of the T-bolt.

Carbide-Tipped Expansion Blade

A carbide-tipped adjustable expansion blade for standard reamers and boring bars is announced by the Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. The blade can be furnished in a variety of standard sizes up to 4 inches.



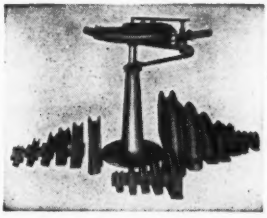
Super Carbide-Tipped Expansion Blade

Gear Coupling

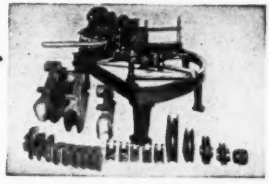
A gear coupling designed for quick and easy installation has been introduced by the Sier-Bath Gear & Pump Co., Inc., North Bergen, N. J. Made of forged high carbon steel and with internal teeth running the full working length, the coupling is said to assure maximum strength. The

BEND PIPE "The American Way"

BY HAND or MOTOR
MACHINES TO BEND COLD PIPE, CONDUIT, BOILER TUBING
AND SOLID BAR . . . BENDING TABLES ALSO AVAILABLE



Above: Hand-powered Type A-30 . . . up to 180° bends . . . all sizes from ½" to 2". Only 7 parts. World's fastest, simplest machine. Note assortment of bending dies . . . this process makes shorter tangents than any other. Occupies only 18" x 18" floor space!

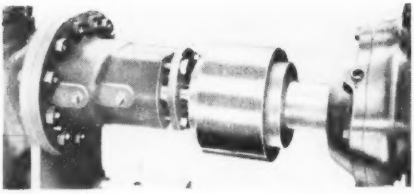


Above: Motor-powered Type E . . . bends fixed radii of 6 to 1 up to 90°. Type E bends 2½", 3", 3½" and 4" pipe. 3 horse-power motor. Floor space occupied—7' 6" x 7' 6". Other power machines up to 8" capacity.

Other Sizes Available

Factory and Main Office: 14 Furnace St., Poultney, Vermont

"American" PIPE BENDING MACHINE Company INC.



Sier-Bath Gear Coupling

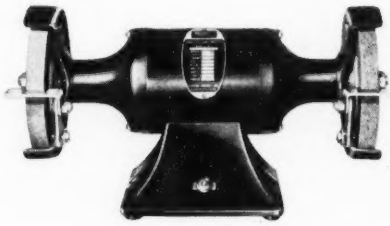
hub teeth are cut radially, permitting accurate alignment without excessive backlash in the teeth.

A snugly fitting Neoprene seal is said to keep oil from leaking out and dirt from entering the coupling. The seal is reinforced with a garter spring and is claimed to have sufficient resiliency to maintain constant closure against slight depressions and uneveness of shaft surfaces. The coupling is made in sizes of ¾, 1, 1½, 2, and 2½ inches.

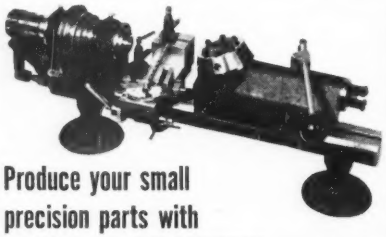
Bench Grinder

Electro Machines, Inc., 68 N. 3rd St., Cedarburg, Wis., announces the production of a bench grinder, under the Doerr trade mark, which is designed to provide ample working area in front of the motor frame and in the space between the frame and the inside of the grinding wheels. Wheel guards are removable for easy attachment of buffing wheels and other grinder accessories.

The grinder is equipped with lifetime lubricated ball bearings for long trouble-free service, and with a standard heavy duty 8-foot cord with plug. All hardware is cadmium plated. Standard equipment includes two 6 x ¾-inch grinding wheels. The unit is available in ratings of ¼ and ½ h.p. at 3,450 revolutions per minute.



Doerr Bench Grinder



Produce your small precision parts with well-known "DERBYSHIRE" accuracy

Illustrated:

The DERBYSHIRE ELECT lathe with 18" bed; ball-bearing headstock with collet closer attachment; double compound rack-and-pinion slide rest with front tool post slide graduated to swivel 360°; six-position turret to take standard tools.

Write for Catalog

F. W. DERBYSHIRE, INC.

WALTHAM 54, MASS. 157 HIGH STREET

THE ERRINGTON ADJUSTABLE DRILLING HEAD

This versatile tool permits you to take advantage of a wide range of adjustment without overhang. ERRINGTON Adjustable Drilling Heads can also be supplied with three spindles for equal adjustment in line and three, four, five or six spindles for equal adjustment on bolt circles. Range from 0 to 1½" drills.

FEATURES: Fully geared. Needle bearings on all spindles in head. Ball thrust bearings throughout. Bronze bushed. Sand cast aluminum case. All parts fully enclosed for pressure lubrication and protection. Non-slip positive clamping on all adjusting members.

Send blueprint, sketch or sample for quotation — no obligation.

Contracted

Established 1891

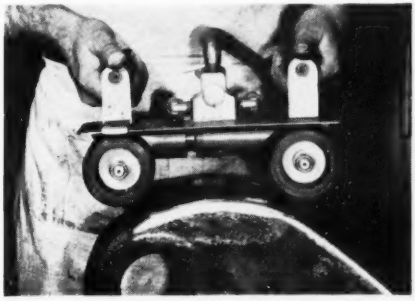
ERRINGTON Mechanical Laboratory, Inc.

Main Office and Plant:

STATEN ISLAND 4, NEW YORK

Air-Driven Belt Sander

An air-driven belt sander adaptable for use on concave or convex metal surfaces has been added to its "Stream-

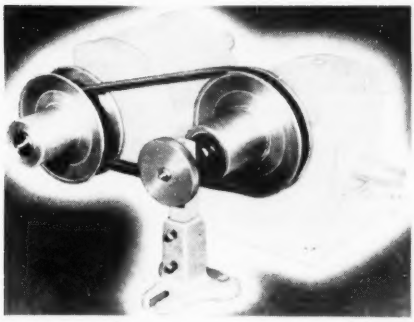


Buckeye "Stream-Power" Belt Sander in Use

Power" line of portable air tools by the Buckeye Tools Corp., 21 W. Apple St., Dayton 1, Ohio. The sander is applicable to all types of metal finishes, both sheet metal and solid castings, and to all types of materials in iron, steel, brass, bronze, solder, aluminum, and magnesium.

Variable Speed Control

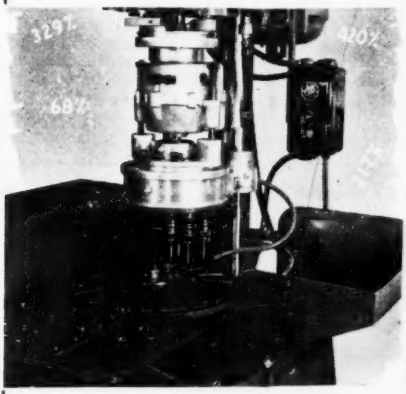
A 1 or 2 h.p. 6:1 ratio variable speed control utilizing standard "B" section belts with fixed centers at any distance



Speed Selector Variable Speed Control

is announced by Speed Selector Inc., 118 Noble Court, Cleveland 13, Ohio. The complete assembly includes two variable

Multiply **SMALL PARTS DRILLING AND TAPPING PRODUCTION**



Ettco-Emrick

SYSTEM OF

MULTIPLE SPINDLE HEADS

Shops all over the country are reporting production increases up to 500% or more with the Ettco-Emrick System of Multiple Heads.

The System provides a complete *production unit* of multiple head and work-holding fixture engineered for fastest handling of the part and for drilling or tapping the maximum number of holes at each stroke of the press. Find out how the System can multiply your drilling and tapping output. Send sample part and hole data for quotation. No obligation.

Write for Bulletin No. 3 for complete details

ETTCO TOOL CO.

598 Johnson Ave., Brooklyn 6, N. Y.

Boston . Portland (Conn.) . Detroit . Chicago

DRILL & TAP CHUCKS • TAPPING ATTACHMENTS
MULTIPLE DRILLING & TAPPING HEADS
DRILLING & TAPPING MACHINES

pitch sheaves and control. A spring-loaded sheave is mounted on the motor shaft while the control sheave is mounted on the driven shaft. A regulating mechanism consisting of a handwheel and bracket, adjustable to any application, opens and closes the control sheave. The changes in pitch diameter cause the standard V-belt to actuate the spring-loaded motor sheave, thus providing for stepless speed control over a 6:1 range. Remote control can be easily applied if desired.

GEARS

GOOD GEARS ONLY

All Kinds—Any Quantity

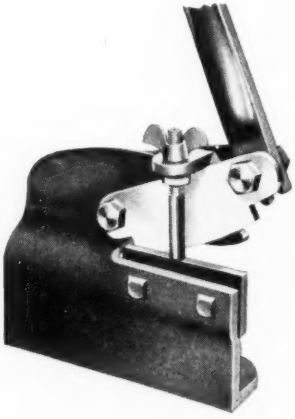
AT THE RIGHT PRICE

THE CINCINNATI GEAR CO.

Wooster Pike Cincinnati, Ohio

Steel Slitting Shear

Product of the W. A. Whitney Mfg. Co., 636 Race St., Rockford, Ill., the Chicago Steel Slitting Shear illustrated here-



Chicago Steel Slitting Shear

with has a capacity of $\frac{3}{16}$ x 2-inch bars and 10 gauge sheets and is also claimed to be efficient for cutting off $\frac{1}{8}$-inch angle iron. The frame is of solid one-piece steel construction, the lever and gear segment is a steel forging, and the blades are made of high grade tool steel.

Roll-Turning Tool

Kennametal Inc., Latrobe, Pa., has introduced a mechanically-held roll-turning tool, designated as the Style LRT, for use in longitudinal feed lathes. The tool has a square nose and is intended to be set

Odd number of flutes

1/16" to 1" dia.

SOLID CARBIDE REAMERS

• Radius relief chamfer •

All lands are highly lapped •

Outstanding performance

Ask for Bulletin A-62

THE ATRAX CO.

Newington, Conn.

Quick Shipment on

TAPER ATTACHMENTS

For All Lathes Old or New—
9" to 24" swing
Write for Bulletin

$29.50 to $125.00

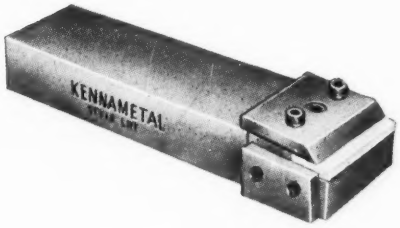
MASTER-TAPER COMPANY

4531 N. Beacon Street
Chicago 40, Illinois

Exclusive Mfrs. of Taper Attachments

at an angle in the tool post to allow for the desired depth of cut.

The Style LRT tool has a solid Kennametal blade held in position on an accurate surface of the supporting shank by a clamp and an advanceable backup plate—each of heat-treated steel. The solid Kennametal blade has four cutting edges that may be used in succession before any sharpening is required. It can then be reground many times (long sides only) and advanced each time to cutting position.



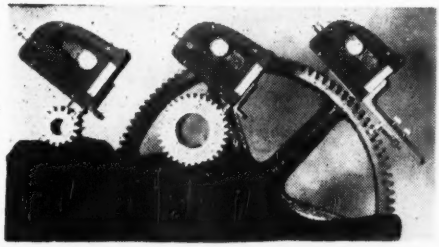
Kennametal Style LRT Roll-Turning Tool

The tool is available in two sizes of 2½ inches wide 1⅞ inches high x 15 inches long and 2½ inches square x 15 inches long.

"Pull-Push" Rule

Stanley Electric Tools, 512 Myrtle St., New Britain, Conn., is marketing a "pull-push" rule contained in a watch-size case which is nickel plated and provided with a brushed satin finish. Vertical markings on the blade are said to facilitate reading in any position. The blade, which is nickel plated, is ½ inch wide and is graduated in 16ths of an inch on both edges and 32nds of an inch on the upper edge for the first 12 inches.

Stanley "Pull-Push" Rule



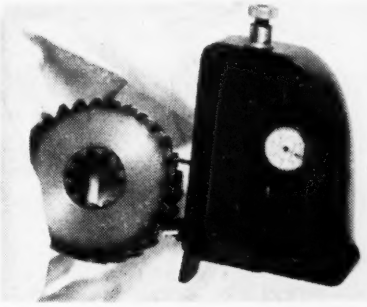
Gearmaster

Precision Micrometer and Gearmaster Sight Reading Gear Charts find: chordal measurement, tooth thickness, tooth spacing, pitch diameter, diametral pitch, backlash allowance, tooth form, and possible mandrel runout . . . in one set-up and in one operation . . . on spur, helical and herringbone gears.

Made of INVAR 35½%-36% Nickel Steel, in which there is little or no expansion up to 400 degrees F.

You can check gears right into the assembled machine even when gears expand from operating heat.

When writing for further details, please give complete information on gears in use.



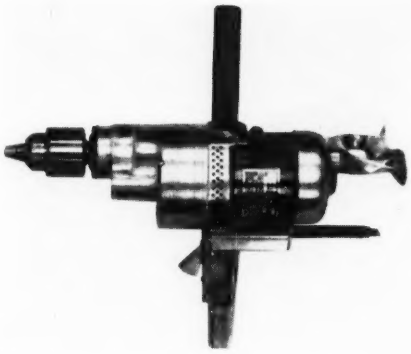
URBAUER ENGR. CO.,

Naperville, Illinois

The Stanley Pull-Push Rule is available in two types, the No. 546 having a 6-foot blade and the No. 548 an 8-foot blade.

Electric Drill

Designed for high and low speed drilling in steel and other materials, a two-speed electric drill powered by a universal motor is being manufactured under the trade name of "Pioneer" by the Louisville Electric Mfg. Co., 3008 Magazine St., Louisville, Ky. The tool includes a gearshift arrangement which extends its use from ¼ to ⅝-inch drilling in steel.



"Pioneer" Two-Speed Electric Drill

The drill is provided with three settings (high, neutral, and low) which enable the operator to quickly shift from neutral to low to high while the motor is operating without the danger of stripping gears. The r.p.m. in the power range is 460 and in the fast range is 880.

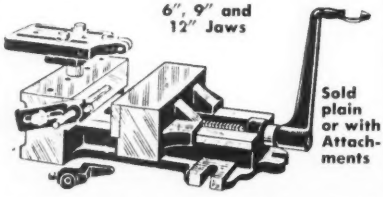
BLUE LAYOUT DOPE

Speeds layout on all metals. Drys fast. Oil resistant. Won't chip, crack or flake off. Comes in handy 8 oz. brush-in cans, pts., qts., drums. Order now! SAMPLE FREE!

TAMMS INDUSTRIES, INC.
228 N. LaSalle St. • Chicago 1, Ill

SAVE

WITH PRECISION VISES



Multi-purpose—shown above, with many attachments optional, saves untold tool-making hours by serving as a ready-made jig and fixture.

Centering—both jaws move toward center, at double-fast rate. Centers work of varying sizes.

Swivel—with exclusive Adjustable Zero Pointer. Drilled to take Attachments if desired.

Request Illustrated Price Bulletin 44

GRAHAM MFG. CO. 38 Bridge St. East Greenwich, R. I.

Clutch Speed Counter

For quickly checking revolutions to determine speeds of motors, generators, machinery spindles, line shafting, grinding wheels, saws, lathes, and similar equipment, Veeder-Root, Inc., Hartford 2, Conn., is offering a handy clutch speed counter which is precision made and finished in chrome satin. Revolutions per minute can be quickly and accurately timed by using any watch with a second hand.

ATLANTIC GEARS precision-cut and inspected, on new, latest equipment. All sizes and types. Send samples or blueprints for quotation.

ATLANTIC GEAR WORKS, INC.
198-A Lafayette St., N.Y. 12, N.Y.
Phone CAnal 6-1441

Veeder-Root Clutch Speed Indicator

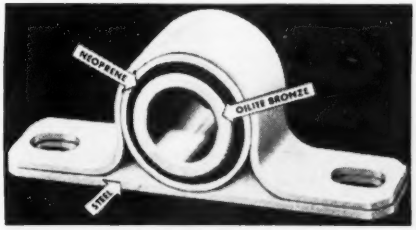
Designed to count to 10,000 and repeat, the instrument is 3¼ inch long x ⅞ inch high x ⅞ inch wide, thus enabling it to be easily carried in a pocket. The counter is recommended for use with a maximum (intermittent) speed of 2,500 revolutions per minute.

Prelubricated Sleeve Bearing Pillow Block

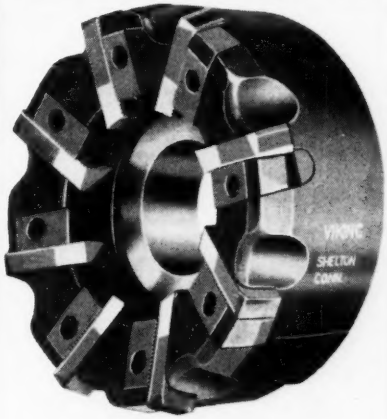
Announcement of a prelubricated sleeve bearing pillow block which is said to feature a means of compensating for both parallel and angular misalignment, minimize transmission of noise, and provide for shock absorption is made by Bushings, Inc., Coolidge Highway at 14 Mile Rd., Royal Oak, Mich. Known as "Silent-Lign," the pillow block employs an Oilite bearing which is enclosed in a bushing or shell of Neoprene, the latter being contained in a base of stamped, welded steel. The mounting for the entire assembly is cadmium plated so as to provide for maximum protection against normal rust.

Standardly available in most of the

"Silent-Lign" Prelubricated Sleeve Bearing Pillow Block



New VIKING
Carbide Face Milling Cutter



IMPORTANT FEATURES

1. **Low Initial Cost**
2. **Longer Blade Life**
3. **Lower Grinding (Sharpening) Cost**
4. **Easier Reblading**

Large carbide tips have just sufficient steel backing to effect the addition of serrations to backs of blades.

Amount of steel brazed to carbide is negligible and the heavy carbide tips remain the dominant material, thus eliminating tendency of bi-metal cracking under thermal strains.

Write for complete details.

Also Makers of
Single Point Carbide Tool Holders

VIKING
TOOL COMPANY
SHELTON, CONNECTICUT

popular smaller shaft sizes beginning at ¼-inch diameter, the Silent-Lign is also furnished in special sizes on order.

Countersink

Known as the Econo-Sink, a "chatter-free" countersink made of high speed steel and designed to cut fast and clean on a wide range of materials, producing smooth, accurate seats, is being introduced by Severance Tool Industries Inc., 724 Iowa St., Saginaw, Mich. The countersink is available in outside diameters ranging from ¼ through 1 inch and with 30, 41, and 45-degree center line angles.

Severance "Chatter-Free" Econo-Sinks

Designed for economical regrinding by the manufacturer, the Econo-Sink can be obtained in the form of a set consisting of six of the most popular sizes of countersinks packed in a convenient and sturdy container with separate space for each of the six sizes.

QUICK DELIVERY
Write for Specification Sheets and Prices . .
COLONIAL BUSHINGS, Inc.
P.O. Box 37, Harper Station, Detroit 13
COLONIAL
DRILL JIG BUSHINGS

Stacking Box

Designed for the handling and storing of medium loads, a stacking box now being manufactured by Bay, Inc., 3015 N. 16th St., Philadelphia 32, Pa., features a continuous stacking rim on all four sides which is said to assure maximum rigidity when the box is stacked; reinforced corners; spotwelded construction; four rivets for extra strength; and drop handle at each end.

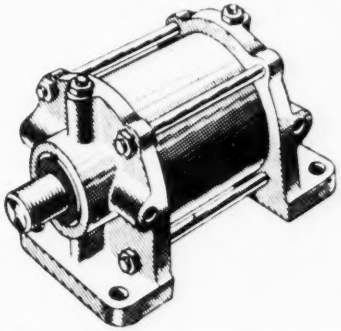
Bay Stacking Box

The box is available in sizes of 10 x 16 x 6 to 10 x 20 x 8 inches and is supplied in 16 and 18 gauge steel.

Air Cylinders

A line of non-rotating double-acting air cylinders with strokes of 1 inch and up is being marketed under the designation B-R by the Richter-Shillair Co., 1317 S. Park St., Saginaw, Mich. The line includes cylinders with bore diameters from 1½ to 8 inches.

The cylinders, which have adjustable cushions at both ends, are available with horizontal, trunnion, pendulum, and vertical mounting arrangements.



B-R Air Cylinder with Horizontal Mounting

Grobet

RIFFLERS

GROBET PRODUCES MORE RIFFLERS IN MORE SHAPES AND SIZES THAN ANY COMPANY IN THE WORLD.

14 NEW SHAPES added by popular demand—over 126 in all!

SOLD THROUGH LEADING SUPPLY HOUSES.

Send for Catalog BF3.

GROBET FILE CO. of AMERICA, Inc.

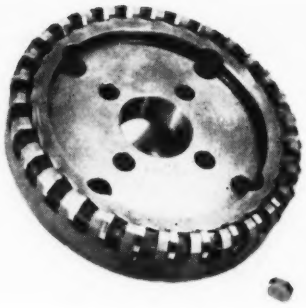
421 Canal Street

New York 13, N. Y.

In Canada—878 Notre Dame West, Montreal

Face Milling Cutter

A high production cast iron face milling cutter has been added to the line of "Future Mill" cutters manufactured by Diamond-Detroit, General Motors Bldg., Detroit, Mich. The cutter, which is designed for feed rates up to 60 inches per minute, utilizes a reversible solid carbide octagonal-shaped blade, permitting 16 production runs without regrinding or resharpening. The economical blade can be either discarded after 16 production runs have been obtained, or can be ground down to a smaller size so as to furnish 16 more runs on some other job which has a reduced depth of cut. The necessary rake, relief and clearance angles are all ground into the cutter body, and accuracy in uniform blade height is accomplished by a locating pin set beneath the blade.



Diamond-Detroit Face Milling Cutter

CASE HARDENING COMPOUNDS FOR TOOLS MACHINERY EQUIPMENT

ONE POUND CAN: $1.44 Plus Postage

OTHER PRICES AND FREE SAMPLE SENT ON REQUEST

KASENIT COMPANY, BOX D

799 GREENWICH ST. NEW YORK 14, N. Y.

Electrode Holder

Designated as the Model No. 6S, a heavy duty cam-action type electrode holder which is claimed to remain cool using electrodes up to ⅜ inch at 600 to 700 amperes under continuous duty cycle has been introduced by Martin Wells, Inc., 5886 Compton Ave., Los Angeles 1, Calif. Silver-brazed cable connections and size 4/0 cable are recommended for use with the holder, which is fully insulated to provide complete safety to the operator, as well as the holder.

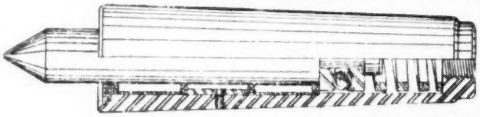
With the Model 6S, electrodes are held firmly in a 60 or 90-degree position by a cam-action gripping arrangement which is claimed to provide a positive contact

"NIROL" *Needle Bearing Live Center*

Designed for heavy loads and precision work. Minimum overhang of center avoids vibration and chatter. Heavy, powerful spring compensates for any expansion of work due to heating during machining. Compact, neat, and rugged. Used for high speeds or heavy roughing cuts.

Morse Taper Sizes:

No. 1 M.T.—$ 15.25
No. 2 M.T.— 21.75
No. 3 M.T.— 26.75
No. 4 M.T.— 32.50
No. 5 M.T.— 49.75



Pat. applied for

No. 6 M.T.—$ 87.50
No. 7 M.T.— 110.00

Bullnose and female center inserts available in sizes listed.

L. F. TREICHLER—PRECISION GRINDING

900 Route 29 North Plainfield, N. J.

Martin Wells Model No. 6S Electrode Holder

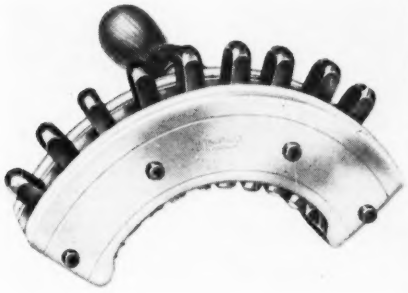
on the electrode and reduce the heating of both the stub and holder. The holder is 15 inches long and weighs 32 ounces.

Periphery Marker

For stamping the outer circumferences of pipe, tubing, axles, large shafts, and other rounded products, the M. E. Cunningham Co., 158 E. Carson St., Pittsburgh 19, Pa., has added the periphery marker shown herewith to its "Luminum-Line" series. Cast in one piece from a durable grade of aluminum alloy, the marker, it is claimed, is 50 per cent lighter than the previous model and yet withstands more severe usage.

The holder is provided with floating springs for retaining stamps and channel beading around the stamp slots to prevent off-angle hammer blows. The holder can be furnished with either one or two rows of stamps, and handles are available to suit any type of marking requirement.

"Luminum-Line" Periphery Marker



HOW TO
STOP

TAPPING
TROUBLES

BEFORE THEY START

Avoiding trouble on routine tapping jobs is usually an easier matter when the job is checked in advance. A little attention, before the job starts, on each of the four major factors is pretty good insurance that you will get a smooth, fast, economical job. Speed and quality of the job depend on these factors, check them carefully.

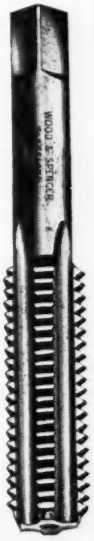
CHECK THESE 4 POINTS CAREFULLY

1 **Material or piece being tapped.**

2 **Machine and fixtures.**

3 **Lubricant and lubrication.**

4 **The tap itself.**



Each major factor, of course, has several important points to be checked, but, when each is right, you are on your way to a fast, low cost job.

When technical problems occur, get detailed assistance from our engineers. Send us complete data —material, depth of hole, whether it's blind or through, type of lubricant used and any other information we should have. We will be glad to give definite suggestions. No obligation, of course.

The Wood & Spencer Company
Cleveland 3, Ohio

New Books

Tool Engineers Handbook. Sponsored by American Society of Tool Engineers. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 2,070 pages. Illustrated. Cloth binding, semi-flexible covers. Price, $15.00.

A reference work on all phases of planning, control, design, tooling, and other operations involved in the mechanical processing of finished products, this volume comprises material written by 152 recognized authors. Included are up-to-date data on tool design, fabrication, maintenance, and utilization; product design and cost estimating; the economical selection of machines, processes, and tools; the analysis and improvement of setups and operations, and so on. Wherever possible and practical, the material presented is based on published governmental, associational, and industrial company standards.

General topics have been split into smaller units for the most convenient reference and use. For example, instead of placing all gear manufacturing methods into one section, the material appears in six separate sections and subsections: Gear Milling and Hobbing; Gear Shaping; Bevel Gear Manufacture; Gear Finishing; Gear Design; and Gear Inspection. The subjects of planning, materials, machines, design, and operations have also been clearly separated. All new important techniques and processes have been covered. Conventional tables of feeds, speeds, and cuts have been modernized to bring data in line with recent advances in today's high speed and high power machine tools, latest cutting materials and cutting practices.

Dynamic Equipment Policy. By George Terborgh. Published by McGraw - Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 290 pages. Cloth binding, board covers.

NO. 44 *Yankee*
TWIST DRILL GRINDER

Grinds Drills Up to 1 1/2"

Fast - Accurate

Built to quickly and accurately grind the lips of twist drills. Properly ground drills cut faster, drill straighter and last longer. Where reaming or tapping is necessary, straight, accurately drilled holes mean savings in time and in tool breakage.

QUICK SET-UP

The Yankee operator can change from one size drill to another almost without interruption as drill is supported in "V's" and does not need to be chucked during grinding operation.

Any workman can quickly learn to operate a Yankee Drill Grinder.

$345.00
WITH MOTOR.
Pedestal and dust collector extra

Send for free illustrated Bulletin MM-109

COVEL INDUSTRIAL GRINDERS **MFG. COMPANY**
BENTON HARBOR, MICHIGAN

Designed to help meet an important management need, this book develops the basic principles of sound re-equipment analysis and discusses practical procedures for their application. It illustrates procedures by numerous examples taken from actual experience; then, in the light of these principles and procedures, it appraises the more popular devices and rules of thumb now in use, showing the errors and frequent absurdities to which they lead. The book develops a concept of the functional degradation of capital equipment with age and use and its functional displacement by superior alternatives, illustrating the process by statistical examples.

American Standard Letter Symbols for Gear Engineering. Second Edition. Published by American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. (also distributed by American Standards Association, 70 E. 45th St., New York 17, N. Y.). Price, 30 cents.

Intended for use in those mathematical equations and formulas that deal with toothed gearing, this standard, prepared by the Sectional Committee on Standardization of Gears, B6, sponsored by the American Gear Manufacturers Association and the American Society of Mechanical Engineers, closely follows the general principles laid down by the Sectional Committee on Letter Symbols and Abbreviations for Science and Engineering, Z10. The new edition has been issued to correct a few errors in symbols and to add some recommendations concerning typography. The system of symbols and subscripts given is not restricted to existing gear terms and relationships but can be extended to cover new problems and new investigations.

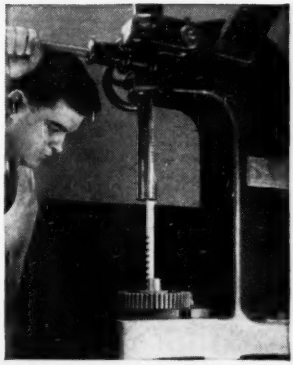
Welding and Cutting Manual. Published by The Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y. 208 pages, 6 x 9 inches, Price, $1.80.

Described as a useful reference and in-

CUT 100 KEYWAYS FOR AS LITTLE AS $8.25

That's the cost of the du Mont *Minute Man* Keyway Broach and Bushing for one keyway size.

If you have a variety of keyways to cut in gears, milling cutters, pulley hubs, collars, couplings, etc., a *Minute Man* Keyway Broach Kit will pay for itself many times over. With it you can hand cut any standard width and depth of keyway in *sixty seconds*. It saves you minutes and money.



Now Available
Minute Man Production Type
Keyway Push Broaches

for multiple production of keyways in moderate quantity — using either hydraulic or hand arbor press. In keyway widths from 1/32" to ¼", for any desired hole diameter. Write for prices.

CLIP THIS COUPON, NOW

The du MONT CORPORATION
Greenfield, Mass.

Please mail me Descriptive Folder and Price List "S"

Name .....

Company .....

Address .....

struction manual for anyone performing welding and cutting operations, this handbook on the oxyacetylene process is written in simple, easy-to-read language and presents instructions in the form of step-by-step photographs of actual repair jobs. Included are hints, short-cuts, and instruction material for performing a variety of welding operations, as well as soldering, hard-facing, cutting, and heating jobs. The appendix contains useful charts and tables, a complete glossary of welding terms, and a list of 100 repair jobs with recommended welding methods.

WESTLEN
Adjustable
Self Centering
REELS
For feeding strip and wire coil stock to presses. Coil capacity 300 to 500 lbs. Outside ring dia., 28" to 36". Height of reel, 36". Wheel automatically adjusts parts to suit inside diameter of coils from 11" to 20". Arm allows for quick conversion to horizontal or vertical position and adjusts height of reel.
Write for prices and literature.
The RULETA Co.
27 WARREN ST. NEW YORK 7,

New Shop Literature

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning MODERN MACHINE SHOP when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

Pipe, Bar, and Angle Iron Bender. The Hossfeld Mfg. Co., Dept. MS 10, Winona, Minn., has available a 32-page booklet on its Size No. 2 wrenchless type universal pipe, bar, and angle iron bender. In addition to installation data, the booklet contains instructions for bending various shapes in pipe, bar, and angle iron, as well as a parts lists for the bender.

Vises, Collet Heads, and Radius Dressers. The Matco Tool Co., 2830-36 W. Lake St., Chicago 12, Ill., now has available a file folder containing bulletins presenting illustrated and descriptive information on a wheel dresser for surface, external and rotary grinders; universal dividing collet head; ball bearing radius-angle wheel former; all-angle precision vise for drilling, grinding, tapping, reaming, counterboring, and so on; drill jig; universal adjustable angle plate; all-purpose vise; cam-locking vise, and other products.

Safety Drill Tables for maintenance and miscellaneous drilling are pictured and described in an eight-page bulletin published by the Modern Machine Tool Co., 601 S. Water St., Jackson, Mich.

Ball and Roller Bearings. A 16-page catalog (No. 25) published by The Gwilliam Co., 358 Furman St., Brooklyn 2, N. Y., describes roller thrust bearings, ball thrust bearings, step bearings, journal roller bearings, and special bearings. The various types are well illustrated and standard sizes are listed in tabluated form.

"How to Specify and Buy Alloy Steel" is the title of a 24-page illustrated booklet published by Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill., information of practical value in the purchase and use of alloy steel is presented under such headings as "How Alloys Are Selected," "How to Make Sure of Getting the Right Alloy," and "How to Check for Compliance with Your Specifications." Also included in the booklet are an explanation of the end-quench hardenability test, data on buying alloy steel on the basis of hardenability, and information on standard and special types of alloy and carbon steels, including aircraft quality free-cutting bars, and tool steels.

Expansion Chucking Reamers, available in sizes from ½ to 3 inches with straight or taper shanks for production reaming, are shown, described, and listed as to dimensions and prices in an eight-page two-color folder distributed by the Union Twist Co., Butterfield Division, Derby Line, Vermont.

Polishing, Buffing, Grinding, and Deburring Equipment is the subject of a 24-page catalog (No. 60) released by Hammond Machinery Builders, Inc., 1621 Douglas Ave., Kalamazoo 54, Mich., which illustrates and describes new and improved polishing lathes; backstands for abrasive belts to be used with polishing lathes; improved o.d. cylindrical finishing machines for tubes, bars, and cylindrical stock; contour finishing machines for odd or irregular shapes; and a new and complete line of 10 Junior Automatics for use in conjunction with polishing lathes or abrasive belt machines.

EASY TO USE

For Quick Adjustments

NO FUMBLING—just pull the right length of stock out of package slot and snip it off. The rest of your material is still protected, needs no rewrapping.

STURDY, METAL RACK—always ready for instant use. Hangs on wall or stands on bench.

HANDY ROLLS—6"x100" lengths packaged in strong dispensing cartons. No waste or spoilage.

CHOICE OF GAUGES—11 gauges from .001" to .010" available in either brass or steel. You pick the gauges you want—no fixed assortments.

● EASY TO USE!
● EASY TO STOCK!
Holds the four gauges YOU want.

SEND TODAY *for catalog sheets with full details of entire line and name of distributor nearest you.*

LAMINATED SHIM COMPANY, Inc.
3308 Union Street **Glenbrook, Connecticut**

SHIMS SHIM STOCK STAMPINGS AN-COR-LOX NUTS

Spindle Nose Lathe Chuck with capacity for bars from $\frac{1}{16}$ to $1\frac{5}{8}$ inches is fully illustrated and described in an eight-page two-color bulletin (49-LC) issued by The Jacobs Mfg. Co., West Hartford 10, Connecticut.

Die Sets and Accessories. A 24-page catalog issued by Standard Die Set Manufacturers, Inc., Providence 7, R. I., presents illustrated, descriptive, and tabular information on die sets of various types, bolster plates, guide posts, punch shanks, bushings, hex socket set screws, socket head cap screws, socket head stripper bolts, dowel pins, diemakers' grease, pressure pad stripper and knockout springs, compression springs, tension springs, and so on.

"Simplified Preventive Maintenance Control for Plant and Production Equipment" is the title of a six-page three-color folder (KD-449) issued by the Systems and Methods Research Department, Remington Rand Incorporated, 315 4th Ave., New York 10, N. Y., which outlines how preventive maintenance records may be combined with property records to ensure that exactly the right amount of equipment is on hand at all times, maintained in top operating condition. A section is also devoted to inventory systems used to control stocks of replacement parts and operating supplies.

Seal and Shield Bearing Charts. A series of charts listing engineering data and specifications, including groove diameters and widths, for the use of Waldes Truarc Inverted Retaining Rings (internal type No. 5008) with seal and shield bearings is being offered by Waldes Kohinoor, Inc., Dept. TR58, Long Island City 1, N. Y. The complete set of charts covers Fafnir, Federal, Hoover, New Departure, and MRC seal and shield bearings.

STRANDFLEX top quality flexible shaft machines feature

4-Speed Gear Drive

Here is the new, modern flexible shaft equipment that has the versatility to meet many plant requirements. 4 different RPM's are available . . . quick and easy . . . by new gear shift method.
The new Strandflex is of the same outstanding quality construction that has been associated for years with Strand equipment.
Write for descriptive folder.

The Balmar Corporation
Woodberry, Baltimore 11, Md.
N. A. STRAND & CO. DIVISION
5001 N. Wolcott,
Chicago 40

STRAND
FLEXIBLE SHAFTS
and
FLEXIBLE SHAFT MACHINES

Engineering Manual No. 10 issued by Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio, includes descriptions, illustrations, and dimensional drawings of all models of Zagar collet fixtures, broaching machines, and multiple spindle gearless drill heads. The manual also contains data sheets on keyway broach standards for Zagar 20 and 36-inch horizontal broaching machines.

Rotary Type Surface Grinder designed for the accurate, rapid removal of stock is fully illustrated and described in an eight-page two-color bulletin (No. 144-2RM) released by the Mattison Machine Works, Rockford, Ill. Complete specifications and examples of work run are presented.

Clutch Head Screws. A 12-page two-color booklet issued by the United Screw & Bolt Corp., Chicago 8, Ill., fully illustrates and describes a line of clutch head screws for a variety of assembly purposes. A section of the booklet is devoted to technical reference data, which are presented in easy-to-read tabular form.

Hot Rolled Alloy Steel Plates, available in widths up to 72 inches and thicknesses to 6 inches, are described in a four-page two-color bulletin (No. 905) issued by W. J. Holliday & Co., Inc., Indianapolis, Ind. Heat-treating data and charts are included.

Gear Checkers. A 12-page booklet describing the Kodak Conju-Gage line of gear checking instruments has been released by the Eastman Kodak Co., Industrial Optical Division, 343 State St., Rochester 4, N. Y. Complete specifications are given for Conju-Gages for making a composite check of spur and helical gears up to 8¼-inch pitch diameter and for the Kodak Backlash Gage for backlash checks of gears of 8¼-inch pitch diameter and larger.

Uniclosed Motor, designed for complete protection against damage from moisture, falling debris, dust, and dirt, is fully illustrated and described in an eight-page multi-color bulletin (No. 1524) issued by U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, California.

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BALL BEARING GRINDERS

RUGGED-BUILT for the long, hard grind
—these Grinders have BALANCED motors & wheels

We build a Complete Line of Bench and Pedestal-type Grinders—all sturdy grinders —with ball-bearings and balanced motors and grinding wheels for smooth, accurate grinding. BELOW: our No. 6110; 1/3 hp. motor; 6" wheels (36 and 60 Grit). Fully adjustable tool rests and eye-shields.

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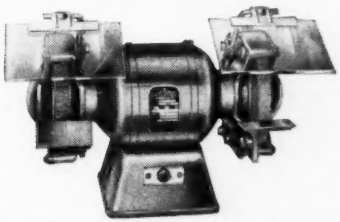

BALDOR ELECTRIC COMPANY
4380 Duncan Ave. (30th Year) St. Louis 10, Mo.

P.S. may we send you **BULLETIN 321-D** *on Complete Line?*

Production Bending Machines. Pedrick Tool & Machine Co., 3643 N. Lawrence St., Philadelphia 40, Pa., has prepared a 16-page catalog presenting illustrations and complete descriptive information as well as tables regarding a line of bending machines for use in fabricating tubular parts.

Acorn Pushnut for ¼-inch unthreaded rod is described and illustrated in a bulletin distributed by The Palnut Co., Irvington 11, New Jersey.

Precision Stop Collets for Brown & Sharpe machines are illustrated, described and listed as to specifications and prices in a four-page two-color bulletin (SC) issued by Hardinge Bros., Inc., Elmira, New York.

Open Back Inclinable Presses. Production advantages of Bliss Open Back Inclinable Presses and improvements on the complete line from 10 to 200 tons capacity are stressed in a 24-page illustrated catalog (No. 2-C) released by the E. W. Bliss Co., Toledo 7, Ohio. An entire section of the catalog is devoted to the various component parts and accessories of the presses, which can be used for blanking, piercing, forming, stamping, combination die work, drawing, assembly work, and so on.

Shims, Lock Nuts, and Stampings. The Laminated Shim Co., Inc., 3308 Union St., Glenbrook, Conn., has issued an eight-page two-color data file containing specifications, design factors, application data and other informative material on shims, lock nuts, and stampings.

Heavy Duty Power Feed for use in performing heavy duty drilling, milling, and grinding operations is illustrated and described in a two-color bulletin released by The Bellows Co., Dept. MMS, 222 W. Market St., Akron, Ohio.

Now every shop can have the advantages of BAND SAWING

The new Wells Model 49A fits the smallest shop's budget, yet it does a man-sized job in any plant. From its welded steel frame to its tubular steel base, the Wells Model 49A is a rugged shop tool that will give long, dependable service. Its portability is unequalled. Capacity: Rectangular—3½" x 6⅝", Rounds—3½" diameter. Easy to operate without special training, the Model 49A can be used by anyone in the shop. Automatic shut-off at the end of the cut eliminates the need for the operator to stand by. Write for complete details.

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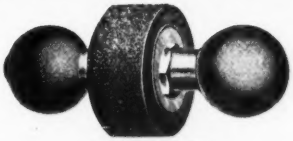

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EXTRA LARGE, HEAVY, BALL-TYPE HANDLES FOR BALANCE
FAST CRUSHING AND FORMING BECAUSE OF ABRASIVE TRUING WHEEL

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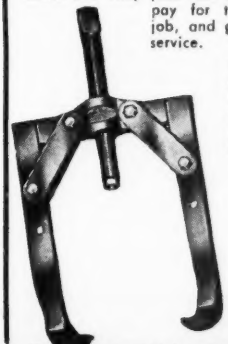
These powerful service tools Pull gears, wheels, bearings and bushings from shafts, easily and quickly. They eliminate pounding, battering and breakage of vital machine parts. They make tedious and risky jobs fast and safe. They usually pay for themselves in the first job, and give years of satisfying service.



12 types, 40 sizes (including special designs for special application) with Drop forged arms and heat treated forcing screws.

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HEAT TREATING PROBLEMS
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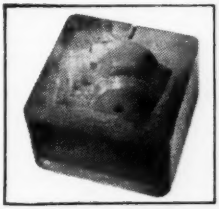
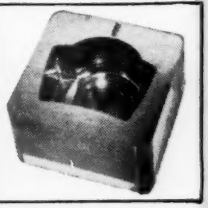
PHOENIX BRAND NON-SCALING COMPOUND has proved so successful in Parker's own plant, it is now being offered commercially to industry. *Not a salt solution* but a specially compounded powder for use in hardening and annealing of steels—tested and proven in hundreds of hardening rooms, PHOENIX BRAND NON-SCALING COMPOUND pays its way in time and money saved. Obtain increased furnace capacity and production! *Recommended for steels hardening up to 1750° F. and for use in all furnaces except bath type.* **TRY IT . . .** discover for yourself the amazing results obtained in time and money saved using PHOENIX BRAND NON-SCALING COMPOUND.



This can be prevented! Note scale, pitting and decarburization . . . a result of normal heat treating. Time can be saved, furnace production increased, costly polishing after heat treating can be virtually eliminated.



This unretouched photo shows clean smooth surface after heat treating using PHOENIX BRAND NON-SCALING COMPOUND. You too can benefit in time and money saved. Eliminate scale, pitting and decarburization

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Self-Lubricating Bearing Materials for experimental, emergency, and small-lot bearing requirements are illustrated, described, and listed as to specifications, sizes of available forms and finished bearings in a four-page catalog (No. 102) published by The Wel-Met Co., 126 Gougler Ave., Kent, Ohio.

Gages. A complete stock list of standard and special gages, including go and not go cylindrical plug gages, thread plug gages, thread ring gages, roll thread snap gages, pipe thread gages, special setting plug thread gages, and adjustable limit snap gages, is being distributed by the Lafayette Tool & Supply Co., 128 Lafayette St., New York 13, New York.

Production Machine Tool. Known as the "Autodrill," a packaged automatic machine that incorporates a combination of rotary and reciprocating motions used for such operations as drilling, reaming, facing, centering, and so on, is illustrated and described in a four-page folder issued by the Auto Tool & Engineering Co., 2908 W. Armitage Ave., Chicago 47, Illinois.

General Purpose Universal Cylindrical Grinder, known as the "Grindwell" and suitable for manufacturing, maintenance, toolroom, and training purposes, is fully illustrated, described, and listed as to specifications, standard equipment, and extra equipment in a four-page two-color bulletin (S-49) issued by the Landis Tool Co., Waynesboro, Pennsylvania.

Test Report on Cutting Fuilds. The F. E. Anderson Oil Co., Portland, Conn., has published a 12-page report (No. 749) on the use of "Lusol" Cutting Fluids by a valve manufacturer on a test run of 833 forged steel valve bonnets for 1-inch 600-lb. inside screw globe valves. The increase in tapping speeds and tap life effected by the use of Lusol is clearly indicated.

Sheet Metal Machines and Tools. The Niagara Machine & Tool Works, 637 Northland Ave., Buffalo 11, N. Y., has issued a booklet (No. 200-G) presenting illustrated, descriptive, and tabular information on presses, shears, machines, and tools for plate and sheet metal work.

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FOR PRODUCTION DRILLING .004-.156"

CUT COST---INCREASE OUTPUT

Flexible Shaft Units

Air-Feed Drill Heads

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Multiple Head Drills

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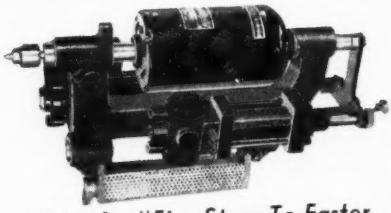
Model 107 shown $213.50, and up COMPLETE



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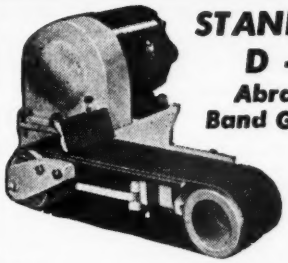

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This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit.

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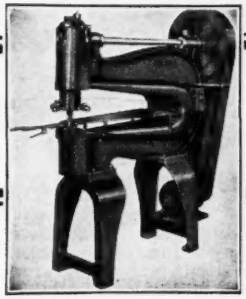

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ASSURE QUALITY RESULTS!

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DELAWARE TOOL STEEL CORP.

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Electric Index Fixture for punch press, tapping machine, drill press, and other similar operations is described and illustrated in Bulletin 97 prepared by the Ettco Tool Co., 598 Johnson Ave., Brooklyn 6, New York.

Improved Industrial Vision—a Bonus for Management, a Benefit for Employees" is the title of a 24-page brochure describing sight conservation programs in industry which has been published by the American Optical Co., Southbridge, Mass. The brochure features case histories and charts demonstrating the cost-saving values of an industrial safety and visual efficiency program.

Variable-Speed Pulley. An eight-page two-color circular issued by the Equipment Engineering Co., 2853 Columbus Ave., S., Minneapolis 7, Minn., presents data on construction features, installations, dimensions, and so on, of its "Hi-Lo" Variable-Speed Pulley designed to provide infinite variable speed with constant speed motors and any make of standard V-belt.

Abrasive Wheels. The Bay State Abrasive Products Co., Westboro, Mass., is distributing a four-page two-color folder illustrating and describing its "Bayflex" Abrasive Wheels, available in straight-sided types for use on bench grinders, cut-off machines and table saws and raised-hub disc types for use on power sanders and grinders. Bayflex Mounted Wheels and Points and Abrasive Sticks are also shown and described.

Jack Locks and Fixture Clamps. The Morton Machine Works, 2421 Wolcott St., Ferndale 20, Mich., has published a 72-page engineering catalog on its complete line of jack locks, fixture clamps, and standard details. Photographs, diagrams, tracing templates, and specifications are included, together with a complete price list.

Hub Sprockets. A six-page illustrated folder issued by the Cullman Wheel Co., 1352-V Altgeld St., Chicago 14, Ill., lists specifications and prices on hub sprockets for standard S.A.E. single and double roller chain.

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FEELER GAUGE STOCK

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Each thickness a distinctive, easy to identify color. Impervious to oil. Long lasting. 5"x20" sheets. Special sizes to order. Handy assortment, shim stock, 12 colors—12 thicknesses (.001-.030). Bound together. $4.25.

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A model for practically every tool room and production operation.

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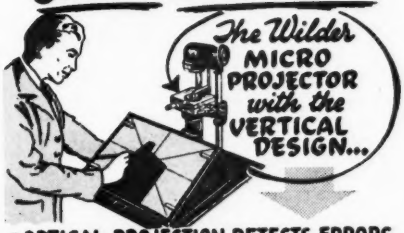

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4. Mandrel capacity to 1½".
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The durable Doyle Vac-It is constructed to handle any cleaning job in your plant efficiently and without the necessity of changing parts. Wet and dry cleaning jobs are all the same to the Vac-It. Dirt and dust are removed from plant and office floors and walls . . . overhead pipes, production line machinery and installations are quickly cleaned and kept free from clogging dirt and metal scraps with the Doyle Vac-It and Doyle equipment. The Vac-It does not push dirt around . . . **it picks it up and removes it from the plant.**

The powerful suction of the Vac-It also recovers lubricants, coolants or water at the rate of 720 gallons per hour.

Vac-It will make all your cleaning jobs easier, faster and less costly.

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Doyle VAC-IT

DOYLE VACUUM CLEANER CO.

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Diamond Compound. A bulletin presenting data on grading and color identification systems, as well as price information and other details, regarding "Dymo" Diamond Compound is being distributed by the Industrial Products Division, Elgin National Watch Co., Aurora, Illinois.

Bushing Price List. Designed to eliminate the necessity of calculating discounts, a revised six-page price list (Bulletin No. 104A20) presenting quantity prices on an expanded line of standard drill jig bushings is available from Colonial Bushings, Inc., P. O. Box 37, Harper Station, Detroit 13, Michigan.

Alox 350, a product described as rich in surface active agents consisting of oxygenated hydrocarbons and derivatives of them and as highly essential in the preparation of preservative lubricants which are required to protect metals from atmospheric corrosion, is covered as to physical and chemical properties and suggested uses in Technical Bulletin No. 3 issued by the Alox Corp., Buffalo Ave. and Iroquois St., Niagara Falls, New York.

Hobbing and Sharpening Machines. The Barber-Colman Co., 5532 Loomis St., Rockford, Ill., has published a 24-page catalog which not only contains illustrations, descriptions, and complete specifications of all Barber-Colman hobbing and hob sharpening machines but also an elementary easy-to-understand discussion of the hobbing process. In addition, the catalog illustrates and describes various types of hobs, milling cutters, and reamers.

Flammables Self-Checking Guide. A 12-page booklet outlining procedures to be followed in helping industry reduce the hazard of and loss by fire in performing storing, maintenance, fabricating, laboratory, assembling, shipping, receiving, finishing, and other operations has been prepared by The Protectoseal Co., 1920 S. Western Ave., Chicago 8, Ill. A pocket in the back of the booklet contains several departmental charts for making easy and accurate check-ups on flammable hazards.

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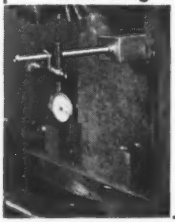
with Magnetic Indicator Stand



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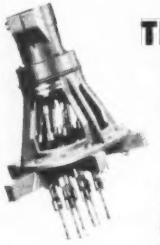

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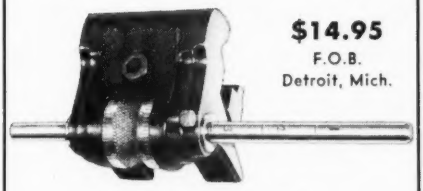

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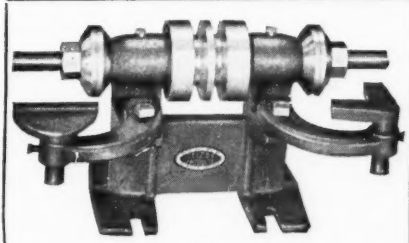

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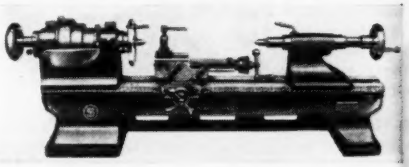

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Latest technical improvements and manufacturing processes give tolerances 20 to 30 per cent closer than those prescribed by Schlesinger Standards—generally accepted as standard in the testing of machine tools.

An available line of attachments and accessories makes this lathe a productive and versatile addition to your plant.

Write for descriptive data on the SV 70 Toolmakers Lathe—its smaller equivalent SV 65 — or Schaublin Turret and Repetition Lathes.

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Your Own Band Saw Blades
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The ERWOOD *Electro*
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Complete with brazer, 6 ft. cord, plug, brazing material and fluxes. Shipping weight 11 lbs.

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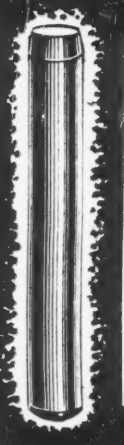
Motor Exchange Plan. Booklet SM-5243 describing in detail its new motor exchange plan for single-phase and three-phase, 1 to 20 h.p., frame 203 to 326, a.c. motors is available from the Westinghouse Electric Corp., P. O. Box 868, Pittsburgh, Pennsylvania.

Atomic Energy for Industry. The Document Sales Agency, P. O. Box 62, Oak Ridge, Tenn., is offering literature listing available Atomic Energy Commission declassified documents of particular interest to industry.

Magnetic Coolant Separators. The Barnes Drill Co., 809 Chestnut St., Rockford, Ill., has published a 12-page two-color bulletin (No. 300) which contains data on the general construction and operating features, specifications, and so on, of its Barnesdril Magnetic Coolant Separators for use with honing machines, grinders, broaching machines, milling machines, gear shaving machines, metal roll forming mills, and other machinery.

Carbide-Inserted Drill Jig Bushings. The W. F. Meyers Co., Inc., Bedford, Ind., now has available a six-page two-color catalog containing illustrated, descriptive, and complete tabular information on carbide-inserted drill jig bushings of the fixed and slip renewable types made to A.S.A. standards. Similar information is presented on headless liners and lock screws. In addition, the catalog contains a table listing drill sizes, decimal equivalents, and tap drills. A separate four-page folder included in the catalog presents latest price data on the various bushings and liners.

SCHULTZ & ANDERSON
DOWEL PINS



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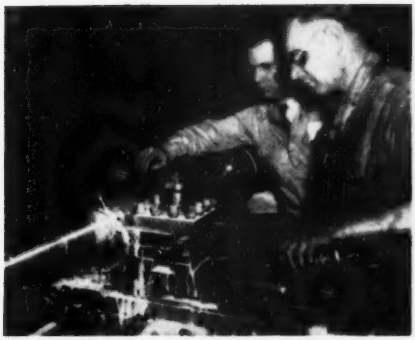

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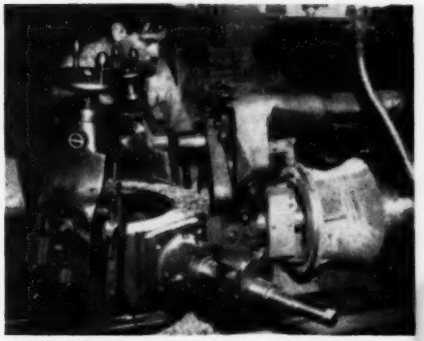

30% to 50% saving in machining time! This amazing saving was achieved when Carboloy-tipped multiple bar tools, designed and fabricated in the company's plant under "Triple C," were used in machining this cast-iron suction head. Here is just another example of "Triple C" results.

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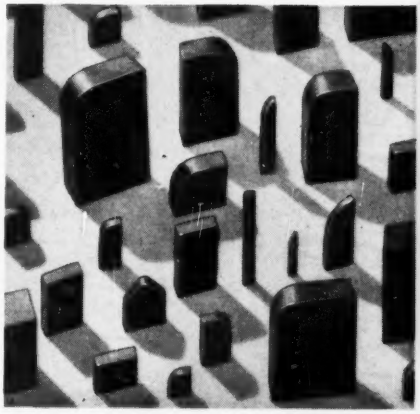
What does the company think of this plan? A company official says: "*We believe in Coordinated Carbide Control because the cost of cutting tools can be kept at a minimum through plant-wide standardization, it necessitates less equipment and personnel, and provides the best equipment and trained specialists.*" And all supervision is sold on the benefits of "Triple C"!

This case is typical. Manufacturers, large and small, are finding that the "Triple C" Plan can keep down variable costs and help lower the all-important break-even point. If production machining of metal is a factor in your operation, it's a good bet that the Plan can produce the same kind of major savings for you. Write today for details. No cost, no obligation.



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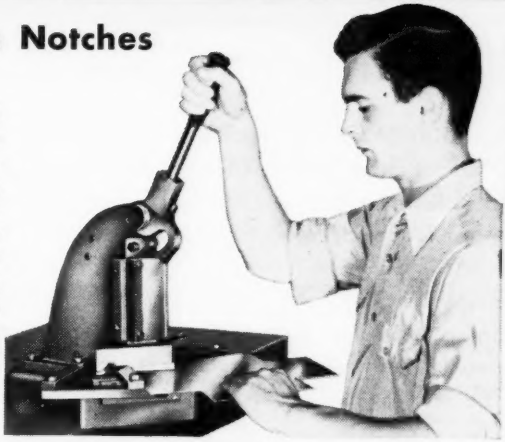

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Over the Editor's Desk

PERIODICALLY the peace and welfare of the American people are jeopardized by the threats of the great labor unions to stop production of necessities if demands for increased wages or other costly advantages are not met within a given period of time. For many years now it has been the custom of the employers to "bargain" with the unions, the bargaining ending with the employers granting at least a substantial part of the demands and then passing the cost on to the public in the form of increased prices for their products. Obviously these increases in living costs for the benefit of organized minorities cannot go on forever, and it is about time that the party who has to pay the bill — the public — was represented at these wage conferences.

At the present moment the steel workers' union is threatening to shut down all steel production unless the steel companies grant retirement pensions to the union members. Realizing the growing opposition of the public to further increases in living costs, the union leaders point to the high profits of the steel manufacturers as justification for increased wage demands. If profits in the steel industry, or any other major industry, are so high as to constitute more than a fair and reasonable return on the capital invested, the best interests of the public as a whole could be served by reducing prices on the products, rather than by increasing wages to a single group.

Regardless of the fact that the combined union membership represents a minority of the working people of America, the union interests are looked after in our government by the Secretary of Labor. He is supposed to represent **all** labor, but the close tie between the Labor Department and the unions is obvious to all. As a matter of fact, the present Secretary of Labor was selected by the labor chiefs.

Yet the welfare of all the working people of the nation—and that takes in some 58 millions—is affected by the decisions made at the bargaining table. And to that 58 million you can add their families.

There is no organized group of consumers to work for lower prices; such an organization is impossible. Lacking organization, the public receives but scant consideration. But one thing is obvious; if insurance and pension programs are to be granted to any workers, they should be granted to all. Then, inasmuch as all the workers must contribute through higher living costs to pay for these benefits, all will become recipients of the benefits—not just the members of the unions. And then we will have a duplicate "Social Security" system.

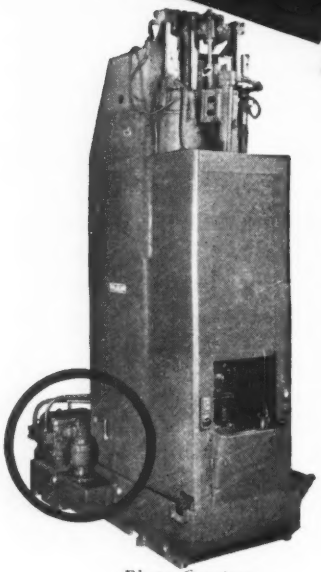
There is no such thing as a "free lunch." But if the public is to be forced to pay for a free lunch for a few, the prize should be made available to all. Until that is done, the unions are taking the public—including some 44 million workers not members of the unions—for a ride.

When will the American people wake up?

Howard Campbell

A Good Coolant Pump...

Saves You Money!



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The Oilgear Co.

Illustrated is an Oilgear Type XM-30 x 54" stroke Vertical Cyclematic Broaching Machine equipped with Ruthman Gusher Pump.

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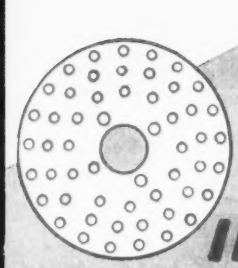

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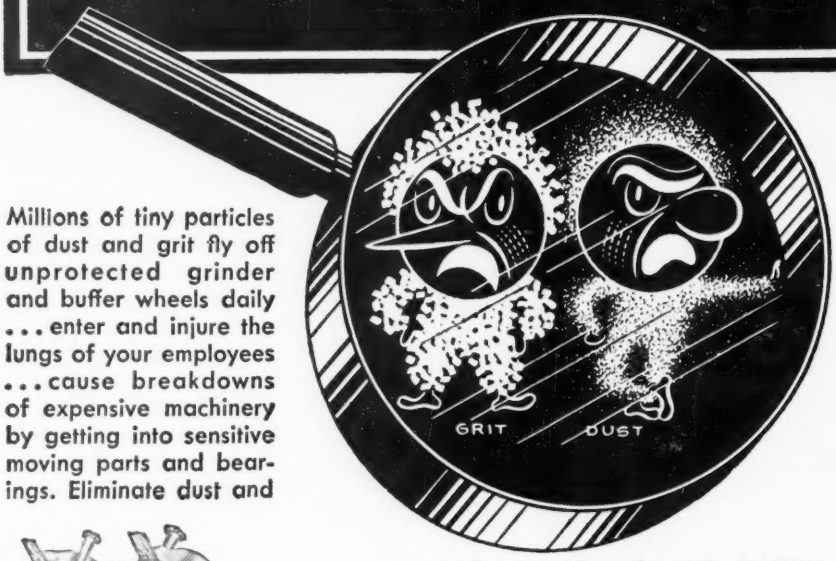

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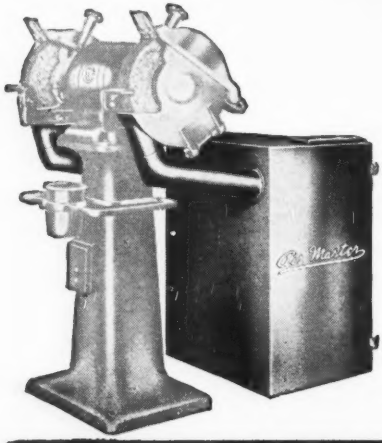

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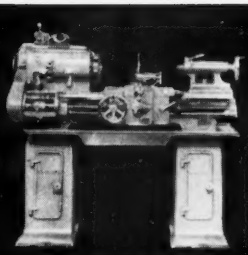

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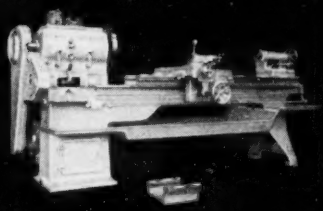

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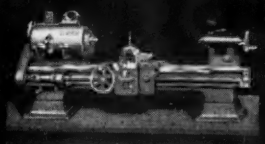

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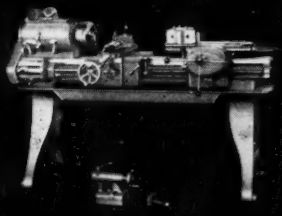

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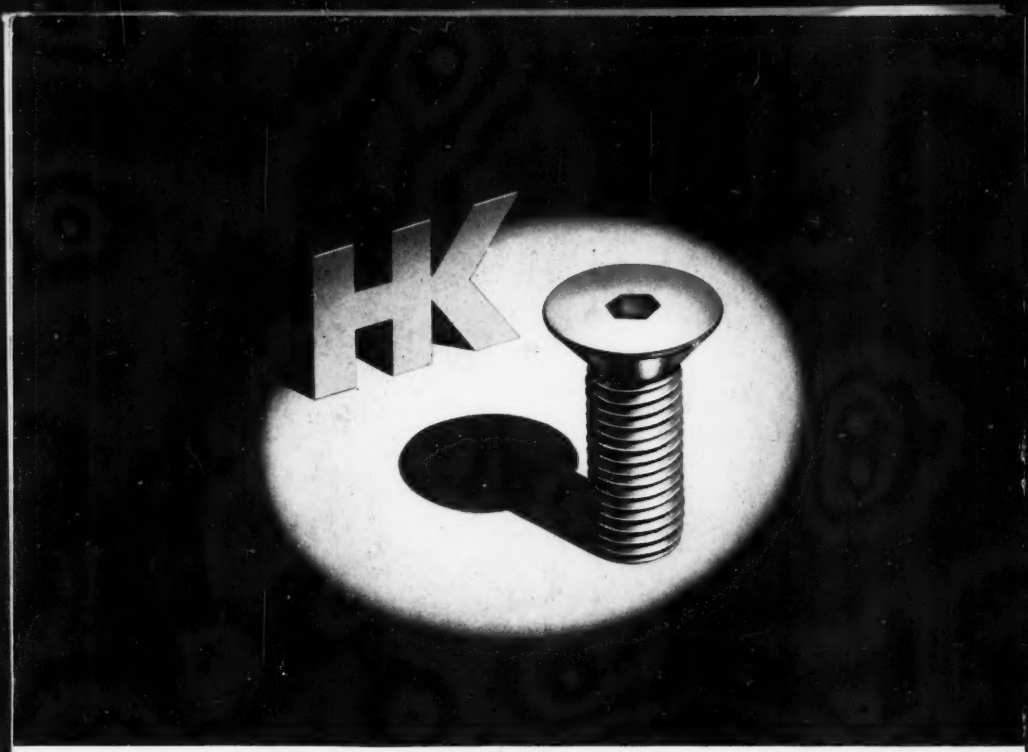

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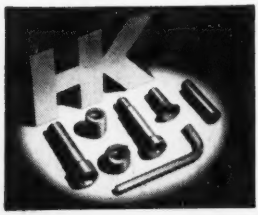

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